

Dismissal of Employees in the Swedish Manufacturing Industry

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This paper examine the macroeconomic influence of the numbers of employees who received notice of dismissal or lay off, in the Swedish manufacturing industry over the period 1980-1994. Given the assumption of fixed labour requirements after the installation of new capital equipments, the statistics over the employees who received notice of dismissal or lay off can be assumed to be closely related to disinvestment. The obtained empirical results suggest that most of the estimated variables is highly significant, both in size and magnitude. The estimations also indicate a significant difference in response to the development of some of the explanantory variables. These findings are reflected in the structural adjustment process of the Swedish manufacturing sector.²

1. *Introduction*

The increased mobility of capital, skills and entrepreneurship, now as the core of the process of globalisation, has become even more important. Increasing technological achievements, the adoption of investment liberalisation policies by many countries, privatisation, and the switch of emphasis by firms to geographical diversification, are some of the more important explanations to the strong expansion in structural change recorded in the past two decades. The important question in this situation concerns the elaboration of an economic policy necessary to increase the adaptability of the industrial sector to meet the demand for structural change.

For a country where international trade represents a significant proportion of the economic activity the equilibrium of the domestic

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² The author is indebted to Bertil Lindström for helpful comments. I would like to thank the participants of the seminar in economics at the Mid Sweden university. Needless to say, the author alone is responsible for any remaning errors.

economy, is to a great extent determined by the conditions given abroad. Against this background, a crucial factor for each individual country is to the extent the industry sector can adjust to changes in foreign market conditions. This adjustment has two interrelated aspects. One is the need to close down uncompetitive capacity. The other is expansion in potentially competitive parts of industry, to be solved only by transferring resources from uncompetitive to more expansive sectors of the economy. Thus, disinvestment (capital depreciation) and investment are both the components of the industrial transformation process. The literature of investment is numerous, but if disinvestment is noticed, it is nearly as a rule assumed to follow a constant geometric rate.³

However, the exchange rate, factor prices, and the value of output are in the context of the transformation process important variables. An undervalued currency (perhaps through a devaluation) increases competitiveness, raises the profit rates, and thus, there is a risk that necessary cost reductions will not be realised. Hence, the incentives to dismantling old investments on obsolescence diminish. On the other hand, an overvaluation of the domestic currency can imply, due to decreasing competitiveness and falling profit rates, a risk of exaggerated cost cuts. Logically, the incentives to dismantling old investments on obsolescence increase. However, different sectors adjust differently, and a structural transformation between sectors will take place. The outcome of the transformation process is a new structural profile of the industry. Indeed, this leads to the question of finding the appropriate balance between competitiveness and an efficient transformation in the industry sector to sustain a desirable growth path in the economy.⁴ These two examples are simple but provide a strong argument for recognising the disinvestment process in the economic analysis. Unfortunately, the estimation possibilities of disinvestment are

³ Swedish capital stocks are calculated by the perpetual inventory method. The gross capital stock at the beginning of the period is a weighted sum of past investments. The net capital stock can be estimated once the probability of survival function is chosen. It is assumed that the capital stock depreciates at a constant geometric rate. See further: SCB, Statistical Reports N 10 SM 9501, Appendix 3. See also Tengblad and Westerlund (1976).

⁴ The influence from the Swedish economist Dahmén is evident here. Dahmén's contribution to the economic analysis of industrial dynamics has greatly influenced much research, both in Swedish economic history and in economic policy. For a survey, see Carlsson and Henriksson (1991).

not possible due to the lack of statistical data.⁵ Consequently, a proxy variable is needed.

To carry out a proxy variable representing disinvestment we have to choose a variable to measure that can be assumed to be closely related. In principle, two variables are here possible. The first is statistics of *bankruptcies*, the second is statistics of *employees who had received notice of dismissal or lay off*. Viewed by itself, the statistical data of the two variables shows strong variation due to economic performance of the manufacturing sectors. In Table 1A (see appendix), reveals an increasing number of bankruptcies and in employees who had received notice of dismissal or lay off in 1981-1982 and in 1991-1993. These was the years then the Swedish economy was in structural stagnation. On the other hand, the period between 1984-1990 shows a reversed picture. In that period the economy was in great expansion, shortage of labour resources, and an increasing inflation.⁶

However, both variables have their weakness as a proxy of disinvestment. Bankruptcies is a legal concept, comprising only a part of the process of disinvestment. In most cases, it is not the whole company or the whole industrial activity that is economic obsolete. For example, it can be an economic necessity to terminate some production or change the method of the manufacturing process. But this request for change does not necessarily imply bankruptcy. On the contrary, in the integrated open economy the request for change in the process of production is an important element of the growth process.

A measure that does not necessarily imply bankruptcy, is employees who had received notice of dismissal or lay off. But, even this measure have its weaknesses. For example, if one part of the company becomes economic obsolete, the labour force can be moved to another activity in the same company. Thus, disinvestment, that has actually occurred in the company, will not be found in the statistics of laid off

⁵ See also Benjamin (1990), and Norén (1989).

⁶ The period (1980-1994) started with a large devaluation to overcome the slow-down of the economy originating from the Seventies. An economic boom with a growing inflation followed. That turned to a financial and economic crises at the end of the Eighties. The economic implications of the German reunification of 1990, and the following exchange rate crises of 1992, Sweden abandoned the fixed exchange rate on november 19, 1992. As a result, a large depreciation (around 15 percent) of the Swedish currency followed. The currency depreciation was an injection to a weak but beginning recovery of the Swedish export sector.

employees. The same situation can arise if the employees would give up work at the company by a retirement plan instead of having a notice of dismissal.

As mentioned above, both variables have their weaknesses, but bankruptcies is a subset of the number of employees who had received notice of dismissal or lay off. Given the assumption of fixed labour requirements after installation of new capital equipments, the latter variable will be chosen as more important measure (proxy) of the disinvestment process⁷. Using this variable to the number of bankruptcies and other conceivable explanatory variables, an endogenous disinvestment⁸ function in terms of employees who had received notice of dismissal or lay off is estimated.

2. *Model specification*

The object of our study is the Swedish economy in the years 1980-1994, a period of large economic changes in Sweden as well as in other countries. Sweden is to a large degree dependent on foreign trade and its industry is highly internationalised. Free trade and stronger integration in Europe is the central element of Swedish foreign and trade policy. The GDP share⁹ for the industrial manufacturing sector was in 1990 about 22 per cent. Agriculture, forestry and fishing was about 3 per cent. Mining and quarrying was about 0.3 per cent. However, the development of industry is crucial for the total economic activity. To face the increased competition from abroad during the 1980s and 1990s, the government, industry, and trade unions cooperated in the restructuring of entire industries.

In order to now bring out this economic structure as an empirical estimation model the explanatory variables have to be introduced. As

⁷ The analysis envisaged here is based on the assumption of substitutability between capital and labour before the installation of new capital equipments but fixed labour requirements after installation. In other words, we here assume a putty-clay model. In other words, this approach incorporates Salters's notion (Salter [1960]) of the vintage structure of industry sectors in the transformation process.

⁸ The literature on endogenous disinvestment is rare, but see Abel (1980), and Epstein and Denny (1980).

⁹ Measured in factor values, current prices.

possible explanatory variables, the total number of bankruptcies, the exchange rate, investment expenditures in current prices, the official discount rate, and value added in 1980 prices are chosen.¹⁰

First, bankruptcies is included in the regression model, but now as an independent variable. This variable is important, and its appearance will become evident in recessions. Second, the exchange rate is an important variable for a small open economy as Sweden with high dependency in trade. The third independent variable is investment expenditures.¹¹ Labour-saving investments are not unusual, on the contrary, most investment in new production capacity has been associated with labour-saving techniques. On the other hand, investment in new capacity often results in an increased demand for labour. Next independent variable is the domestic official discount rate. For example, a more restrictive domestic monetary policy implies that bank loans will be more expensive, both for enterprises and households. A decrease in demand for commodities, the request for new capacity turns down, and so also the demand for labour. Finally, value added is a measure of the sum of incomes (including profits) paid to the factor of production used by the industry to produce its commodities. Thus, it is a measure of the level of industrial activity.

The commodities are here classified according to input characteristics rather than by using standard industrial classifications. From a theoretical point of view, commodities should be set up in a way which would achieve internal homogeneity.¹² A classification in capital-intensive, labour-intensive, and knowledge-intensive commodities is applied. International trade is, of course, essential in an open economy, and the theory of international trade (Heckscher-Ohlin) relays on a definition of commodities in terms of input characteristics. The theory

¹⁰ If the relative wage-cost had been included in the regression model, substitution between capital and labour had to be permissible, even after the installation of new capital equipments. Needless to say, this had been in conflict with the putty-clay assumption. As a logical consequence, dismissal of employees couldn't be claimed to reflect disinvestment.

¹¹ The concept of investment comprise both investment in machinery and buildings. In other words, the two kinds of investment has been added.

¹² The homogeneity assumption requires that all commodities of a single sector should be produced in strictly fixed proportions, that each sector should have a single input structure, and that there should be no substitution between the commodities of different sectors.

of international trade is a theory of the division of labour across different types of production activities.

The *capital-intensive* manufacturing sector comprises Sweden's traditional basic industries and includes mining, pulp and paper, and the iron steel industry. The distinguishing feature of the production process is the relatively high capital-labour ratio. In 1990 this sector accounts for 35 per cent of total manufacturing¹³.

- Mining and quarrying.
- Manufacture of paper and paper products, printing and publishing.
- Manufacture of chemicals, petroleum, coal, rubber and plastic products.
- Manufacture of non-metallic mineral products except products of petroleum and coal.
- Basic metal industries.

The *labour-intensive* manufacturing sector includes sawmills, and the textiles industry. There is a long tradition of strong competition from low-wage countries. This is an important explanation for the long-run decline of employment in many parts of this sector. In 1990 this sector accounts for 18 per cent of total manufacturing.

- Manufacture of food, beverages and tobacco.
- Textile, wearing apparel and leather industries.
- Manufacture of wood and wood products, incl. furniture.
- Other branch of industries.

The *knowledge-intensive* manufacturing sector includes a number of large international engineering companies, for instance Ericsson, Volvo and ABB. The large proportion of highly educated employees in this sector distinguishes it from other manufacturing sectors. This sector accounted for 47 per cent of total manufacturing in 1990.

- Manufacture of fabricated metal products, machinery and equipment.

¹³ Note, the mining and quarrying industry is included in the manufacturing sector.

This sector is the largest manufacture sector in Sweden. In 1990 it was 44 per cent of total manufacturing in Sweden.¹⁴ The sector is comprised of the following subsectors.

- Manufacture of fabricated metal products, except machinery and equipment.
- Manufacture of machinery and equipment.
- Manufacture of electrical machinery, apparatus, appliances and supplies.
- Manufacture of transport equipment, except ship building.
- Manufacture of professional, scientific, measuring and controlling equipment, and of photographic and optical commodities.
- Ship building and repairing.

3. *Estimation Results*

Using the above specification and assuming the variables have been observed accurately, the estimates of the coefficients have been obtained by the *OLS*. The period of estimation is 1980-94, and the results of the estimated equations is presented below. The employees who had received notice of dismissal or lay off (*L-off*) is the dependent variable, and is estimated on the total number of bankruptcies (*BR*), the exchange rate ($ER_{Kr/\$}$), the official discount rate ($Interest_D$), investment expenditures in current prices (*INV*) and finally, value added in 1980 prices (*VA*).

For the purpose of illustration the regression coefficients are transformed into (constant) elasticities, i.e. the effect of the percentage change in the dependent variable associated with a given percentage change (one per cent) in the respective independent variable, defined in the estimated equation.¹⁵ Since the estimated regression coefficients have the expected signs and the magnitudes of the coefficients are not unreasonable, the estimates have been accepted, as judged by the criteria of *SE* of regression coefficients, and the *DW*. Values of *t*, calculated as the ratio of the estimated parameter value to its standard

¹⁴ Value added 1990 is measured in factor values, current prices.

¹⁵ To obtain the elasticity value, see Philips, L., (1974), p.117.

error, are also presented.

The DW , is a powerful test against errors that follow a first order serial correlation, provided the estimated equation does not contain a lagged dependent variable. A value below two suggesting positive serial correlation, and a value above two negative serial correlation. The presence of serial correlation will lead to the conclusion that the parameter estimates are more precise than they actually are, i.e. the estimates of the standard errors obtained from the regression will be smaller than the true standard errors. The R^2 , which serves as a measure of percentage of total variance of the dependent variable explained by the equation, is also presented with each equation.

Turning to the empirical results we start with the capital-intensive manufacturing sector. Thus,

$$\begin{array}{l} \text{Ln}L\text{-off}_C = 21.86 + 1.33\text{ln}BR_C - 1.80\text{ln}ER_{K/\$} - 1.91\text{ln}INV_C \\ SE \quad \quad \quad (3.09) \quad (0.29) \quad (0.58) \quad (0.39) \\ t\text{-statistics} \quad (7.08) \quad (4.58) \quad (-3.12) \quad (-4.90) \end{array}$$

$$R^2 = 0.81 \quad \quad DW = 2.52$$

Long-term investment decisions with large-scale investment expenditures, together with high capital costs characterize the capital-intensive manufacturing sector. Structural rationalisation and economics of scale have induced a concentration of establishments, and thus, the number of production units have been reduced. Investment opportunities, not fluctuations in capacity level, is the important strategical variable for employment decisions in the capital-intensive manufacturing sector. Moreover, exports from this sector is considerable in most industrialised countries. In Sweden in particular, since the traditional basic industries is of relatively great importance for the whole economy. Hence, a depreciation in the exchange rate with increasing investment expenditures has a strong and significant growth effect, and of course, reduces the number of the employees who had else received notice of dismissal or lay off. This result coincides with empirical evidence. On the other hand, increasing number of bankruptcies will, not unexpectedly, increase the number of the employees who received notice of dismissal or lay off. This result emphasise the importance of growth as a crucial factor to acquire employment.

In an alternative estimate we have added the official discount rate.

As expected, increasing official discount rate (bank rate) has a positive, significant effect on the number of the employees who received notice of dismissal or lay off.

$$\begin{aligned} \text{Ln}L\text{-off}_C &= 16.94 + 1.44\text{ln}BR_C - 1.34\text{ln}ER_{Kr/\$} + 1.17\text{ln}Interest_D \\ SE & \quad (3.47) \quad (0.25) \quad (0.54) \quad (0.53) \\ t\text{-statistics} & \quad (4.88) \quad (5.65) \quad (-2.49) \quad (2.20) \\ & - 1.81\text{ln}INV_C \\ & \quad (0.34) \\ & \quad (-5.34) \end{aligned}$$

$$R^2 = 0.87 \quad DW = 2.85$$

However, we must pay attention to the the presence of a slight negative serial correlation. As noted, this will lead to the conclusion that the estimates of the standard errors obtained from the regression will be smaller than the true standard errors. We now continue with the labour-intensive manufacturing sector.

The companies in the labour-intensive manufacturing sector is in general small and medium-sized.

$$\begin{aligned} \text{Ln}L\text{-off}_L &= 44.23 + 1.41\text{ln}BR_L + 1.76\text{ln}Interest_D - 4.60\text{ln}VA_L \\ SE & \quad (39.17) \quad (0.71) \quad (0.84) \quad (3.64) \\ t\text{-statistics} & \quad (1.13) \quad (1.98) \quad (2.08) \quad (-1.26) \end{aligned}$$

$$R^2 = 0.64 \quad DW = 1.85$$

They are characterised by a relative strong concentration on import substitution, but also companies with high import dependence is represented in labour-intensive manufacturing sector. In this sector the request on renewal of the process of production, and hence disinvestment, is probably low. The explanation is relatively low growth in the sector, and thence, low requirements of new capacity. Due to low request on renewal of the process of production, increased need of capital may be combined by a longer life time in certain establishments.

Turning to the estimation above, the number of bankruptcies, the official discount rate (bank rate), and value added, as the measure of the

level of industrial activity, are here the explanatory variables. The value added variable has low significance. In addition, R^2 is rather low.

The R^2 is not improved in the next alternative estimation. However, we have to note the improvement of DW . Further, the exchange rate, is not significant.

$$\begin{aligned} \text{Ln}L\text{-off}_L &= 44.92 + 1.51\text{ln}BR_L + 0.90\text{ln}ER_{K/\$} + 2.12\text{ln}Interest_D \\ SE & \quad (39.45) \quad (0.72) \quad (0.98) \quad (0.94) \\ t\text{-statistics} & \quad (1.14) \quad (2.08) \quad (0.92) \quad (2.26) \\ & - 4.97\text{ln}VA_L \\ & \quad (3.69) \\ & \quad (-1.35) \end{aligned}$$

$$R^2 = 0.67 \quad DW = 1.93$$

But apart from that, the estimated positive sign on exchange rate is as expected. The explanation is probably the structure of production in this sector. As noted, the establishments are characterised by a relative strong concentration on import substitution, but also companies with high import dependence represented.

Finally, in the knowledge-intensive manufacturing sector new technology and new products, are not only the driving forces, but also strategical for the competitive situation. Thus, a continuous renewal of the process of production is necessary. To work with the latest technology is here important. As a consequence, the lifetime of capital will become relative short. The knowledge-intensive manufacturing sector comprises all manufacture of fabricated metal products, machinery and equipment. As noted, it accounted for 47 per cent of total manufacturing in 1990.

We start with an estimate based on two explanatory variables, i.e., the number of bankruptcies and value added. The latter as a measure of the level of industrial activity. Since the coefficients have the expected signs and are highly significant, the estimate has been accepted.

$$\begin{array}{l} \text{Ln}L\text{-off}_K = 65.83 + 1.41\text{ln}BR_K - 5.92\text{ln}VA_K \\ SE \quad \quad \quad (8.94) \quad (0.17) \quad (0.85) \\ t\text{-statistics} \quad (7.36) \quad (8.27) \quad (-7.00) \end{array}$$

$$R^2 = 0.88 \quad DW = 2.43$$

We extend the estimation with a third explanatory variable, the official discount rate (bank rate). The parameters are acceptable, both in signs and magnitude. However, the *DW* suggest a problem of negative serial correlation. There are several procedures available to cope with the problem of serial correlation. However, no such procedure has been applied in this study.¹⁶

$$\begin{array}{l} \text{Ln}L\text{-off}_K = 58.93 + 1.46\text{ln}BR_K + 0.82\text{ln}Interest_D - 5.48\text{ln}VA_K \\ SE \quad \quad \quad (8.76) \quad (0.16) \quad (0.42) \quad (0.79) \\ t\text{-statistics} \quad (6.73) \quad (9.41) \quad (1.97) \quad (-6.92) \end{array}$$

$$R^2 = 0.91 \quad DW = 3.03$$

Now, we change the official discount rate (bank rate) to the exchange rate. The *DW* is improved, but the exchange rate is, not significant as an explanatory variable.

$$\begin{array}{l} \text{Ln}L\text{-off}_K = 64.01 + 1.44\text{ln}BR_K - 0.39\text{ln}ER_{Kr/\$} - 5.70\text{ln}VA_K \\ SE \quad \quad \quad (9.38) \quad (0.18) \quad (0.50) \quad (0.90) \\ t\text{-statistics} \quad (6.82) \quad (8.15) \quad (-0.78) \quad (-6.30) \end{array}$$

$$R^2 = 0.88 \quad DW = 2.69$$

To establish a significant exchange rate estimate for this sector is difficult. The explanation is probably that the sector comprises a large

¹⁶ There are four procedures that have been commonly used. These are the Cochrane-Orcutt procedure, the Durbin procedure, the Hildreth-Lu procedure, and the ML procedure. See for instance Maddala, G. S., (1979).

share of total manufacturing. From enterprises that work on a global market to a small subcontractor on the local market. The different companies have, of course, a different kind of dependence in their foreign relations. That difference in structure is reflected in our difficulty to find an appropriate estimation that includes the exchange rate.

4. *Concluding Notes*

This paper has attempted to shed some light on the macroeconomic influence of the numbers of employees who received notice of dismissal or lay off in the Swedish manufacturing industry over the period 1980-1994. Given the assumption of fixed labour requirements after the installation of new capital equipments, the statistics over the employees who received notice of dismissal or lay off is assumed to be closely related to disinvestment. In other words, disinvestment is measured in labour units.

Using this variable, i.e., employees who had received notice of dismissal or lay off, to other conceivable explanatory variables, the obtained empirical results suggest that most of the estimated variables is highly significant, both in size and magnitude. Consequently, there is a significant influence from the variables that are estimated. Further, the estimations seems to indicate a significant difference in response to the development of some of the explanantory variables. These findings are reflected in the transformation pressure and the structural adjustment process of the Swedish manufacturing sector.

For example, the exchange rate, a variable that suggest a relative strong significance for the capital-intensive manufacturing sector. Then the exchange rate increases, the profit rate in this sector increase despite no increase in productivity growth, i.e., a "windfall gain". This specific "windfall gain" has been a frequent element for the Swedish capital-intensive manufacturing sector. Capital-intensive manufacturing comprises traditional basic industries and is the leading export sector in Sweden. The repeated exchange rate increases can be seen as a compensation for a troublesome, and not settled, cost structure in this sector. The profitability of the capital manufacturing sector has been possibly affected, but at the expence of its own necessary structural transformation has been delayed. Moreover, the two other manufacturing sectors, in particular, the knowledge-intensive manufacturing sector has been negatively affected by the repeated exchange rate

increases.

Despite the exchange rate is not found significant as an explanatory variable in the knowledge-intensive manufacturing sector, certain companies within this sector, the export companies, the exchange rate is probably important. As already mentioned, to work with the latest technology is important for the knowledge-intensive manufacturing sector. An increasing exchange rate will reduce the incentive for the necessary renewal of technology. On the other hand, the subcontractors with large import dependence, may also be harmed by the increased exchange rate through higher import prices. All in all, with frequent increased exchange rate productivity falls, and we get a transformation to the advantage of capital-intensive manufacturing at the expense of knowledge-intensive manufacturing.

Regarding the alternative explanatory variables, we find a striking similarity between the estimates, both in size and magnitude. The exception is the estimated values of the official discount rate. Moreover, and as previously mentioned, investment opportunities not fluctuations in capacity level, is the important strategical variable for employment decisions in the capital-intensive manufacturing sector. An explanation, is that this sector comprises the main part of the traditional basic industries. These industries have a close connection to raw materials in Sweden. The availability to raw materials and domestic production capacity is the important variable for employment of labour, not temporary fluctuations in value added.

In order to make an assesement of economic transformation, it is also essential to consider the economic situation in general. An economic situation could be dominated by opportunities. Or in other words, of new fields of activities. An economic situation could also be dominated by a necessity of adjustment and adaptations. The first situation will give rise to a positive transformation pressure. The second situation, a negative transformation pressure.¹⁷ Consequently, the structure of the transformation process must be seen in a total context. In this connection, the two concepts of transformation pressure - positive and negative - must be taken into consideration, and in some way or another be integrated in the scenario.

¹⁷ Positive and negative transformation pressure and their importance of the general transformation process has attracted much attention by Dahmén, who is also the founder of the concept in economic analysis. Dahmén's total contribution is documented by Carlsson and Henriksson (1991).

This adapts the economic tools to a whole new range of issues which are, and in particular will be, of major concern to policy makers for some time to come. Economic policy to support capacity expansion must comprise both investment as well as disinvestment. A new variable, disinvestment (endogenous disinvestment), must be taken into consideration. How this variable responds to changes of other variables of the economy, and how disinvestment activities can be influenced by economic policy, is here important knowledge. The results in this paper should be treated with caution. A lot more empirical work is needed to draw any definite conclusions. This is only a beginning, but it puts forward a distinct approach to further development.

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APPENDIX

Table 1A Employees who had received notice of dismissal or lay off. Bankruptcies.

Year	K	L	C	K	L	C
1980	7926	21601	20486	178	312	181
1981	25489	41518	23599	227	530	238
1982	26054	34468	27471	390	318	191
1983	22812	26503	9012	387	247	196
1984	9030	19808	3708	351	278	194
1985	12446	26533	6907	404	325	181
1986	15829	19427	4435	447	312	194
1987	7485	16002	5501	387	291	212
1988	7251	15099	3072	337	271	207
1989	4732	11539	5065	394	248	230
1990	16289	29468	8688	665	398	342
1991	62026	91396	16727	1146	566	588
1992	70224	131191	31161	1220	677	590
1993	31729	97627	13909	895	489	476
1994	4636	3678	2420	504	374	303

K is knowledge intensive manufacturing, **L** is labour intensive manufacturing, and **C** is capital intensive manufacturing.

Source: SCB, Statistical Yearbook of Sweden. Statistics Sweden.

