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The employment elasticity in manufacturing: a comment on Mazumdar

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We show that Mazumdar's recently proposed methods for estimating the elasticity of the wage bill with respect to output growth, and for decomposing the growth rate of the wage rate into an output effect, an employment effect, and a price effect, are problematic. The decomposition proposed is a tautology because it can be equally derived from an accounting identity. Likewise, we show that the alleged elasticity of the wage bill with respect to output growth has to take on a value of unity by definition.

Key words: Accounting identity, Labour share
JEL classifications: N30, O15, J30, J41

In a recent paper in this Journal, Mazumdar (2003) argues that a major determinant of employment elasticity is the way output growth is divided between employment growth and wage growth, since there is a trade-off between the two. But the outcome of the trade-off, he argues, depends on the *parameter* determining the share of wages (i.e., the elasticity of the wage bill with respect to output growth), and on a price effect. To this purpose, Mazumdar proposes a methodology for decomposing the factors affecting real wage growth rate into the rate of growth of real output (the output effect), the rate of employment growth (the employment effect), and the relative prices (the price effect).

The objective of this comment is to show that the wage rate growth decomposition proposed by Mazumdar is a tautology, since it can be equally derived from an accounting identity. Moreover, contrary to what he indicates, we show that the alleged elasticity of the wage bill with respect to output growth (α) has to take on a value of unity by definition, if his own method is implemented correctly.

Mazumdar postulates a *behavioural relationship* defining the movement of the wage bill with respect to value added over time given by:

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$$S_w = AV^{\alpha} \tag{1}$$

where S_w is the total wage bill, A is a positive constant less than unity, determined by the base-year share of wages, V denotes value added in current prices, and α is a technological and behavioural parameter *assumed* to remain constant. Mazumdar argues that 'it can take any positive value', and that if it takes on 'a value of unity, the share of wages remains constant' (Mazumdar, 2003, p. 570).

Denoting employment as L, the real wage rate as w, real value added as v, the index of producer prices as P_p (i.e., $V = vP_p$) and the index of consumer prices as P_c (i.e., $w_n = wP_c$ where w_n denotes the nominal wage rate), it is easy to write the growth rate of the real wage rate as:

$$\dot{w} = \alpha\dot{v} - \dot{L} + (\alpha\dot{P}_p - \dot{P}_c) \tag{2}$$

where a dot on top of the variable indicates a growth rate. This is akin to a growth accounting exercise, where $\alpha\dot{v}$ is the output effect; $-\dot{L}$ is the employment effect (the negative sign indicates the trade-off between wage and employment growth); and $(\alpha\dot{P}_p - \dot{P}_c)$is the price effect.

Mazumdar (2003, p. 571) indicates that there are two ways to estimate α, the only unknown in (2).

The first is to treat (2) as an *identity* and solve it for α, that is:

$$\alpha = \frac{\dot{w} + \dot{L} + \dot{P}_c}{\dot{v} + \dot{P}_p} \tag{3}$$

The second method is to infer it econometrically by estimating equation (1). Mazumdar, however, only used the first method.

To prove our point, consider the definition of the wage share (θ), that is,

$$\theta \equiv \frac{S_w}{V} \equiv \frac{(wP_c)L}{(vP_p)} \tag{4}$$

where the symbol $\equiv$ indicates that the relationship is an *accounting identity*, not a behavioural relationship. It is important to note that the meaning of the term 'identity' in equation (4) is different from that used by Mazumdar in the context of his first method, namely, equation (3), as the latter is supposedly derived from a behavioural equation. Note that the wage bill and value added do change over time and, therefore, so does θ. The growth rate of the real wage rate can be written as:

$$\dot{w} \equiv \dot{\theta} + \dot{v} - \dot{L} + (\dot{P}_p - \dot{P}_c) \tag{5}$$

and it is obvious that expression (5) can be rewritten as:

$$\dot{w} \equiv \dot{\theta} + \alpha^{\star}\dot{v} - \dot{L} + (\alpha^{\star}\dot{P}_p - \dot{P}_c) \tag{6}$$

where, by construction, $\alpha^{\star} \equiv 1$. Now compare expressions (2) and (6). The only difference is $\dot{\theta}$. We can solve (6) for $\alpha^{\star}$, i.e., consider it as an *identity* in Mazumdar's sense, and obtain:

$$\alpha^{\star} \equiv \frac{\dot{w} + \dot{L} + \dot{P}_c - \dot{\theta}}{\dot{v} + \dot{P}_p} \equiv 1 \tag{7}$$

A comparison of expressions (3) and (7) indicates that if there is any deviation of α in expression (3) from unity, it must be because of the omission of the change in the labour share ($\dot{\theta}$). This would be correct if, and only if, the labour share were perfectly constant empirically, in which case $\dot{\theta} = 0$. As indicated above, it is true that Mazumdar indicated that α would equal unity if the share of wages remained constant. The problem is that if the labour share is not constant, expression (3) biases the estimate of α owing to the omission of $\dot{\theta}$.

Evidence is provided in Table 1. It shows the decomposition of the growth rate of wage rate ($\dot{w}$) and α according to expressions (6) and (7) on the left-hand side; and the decomposition of $\dot{w}$ and the values of α according to expressions (2) and (3) on the right-hand side (assuming $\dot{\theta} = 0$), using data from UNIDO for the manufacturing sector (the same as Mazumdar) for Korea and Indonesia for 1971–1992. Both are calculated year by year, instead of averaging for subperiods, as Mazumdar did. This way it becomes much more obvious that $\alpha^{\star}$ is unity. It can be seen that the decomposition according to expression (2) distorts the output and price effects because of the use of α instead of $\alpha^{\star} \equiv 1$. The difference in the three effects between Mazumdar's procedure and ours can be computed by subtracting equation (2) from equation (6). This yields $\dot{\theta} + (1 - \alpha)\dot{v} + (1 - \alpha)\dot{P}_P$. This indicates that Mazumdar's output and price effects are somewhat distorted due to the use of α instead of $\alpha^{\star} \equiv 1$, and mostly the omission of the labour share effect $\dot{\theta}$. The employment effect is, by construction, the same.

Let us briefly discuss now the second method to obtain α, econometric estimation, which Mazumdar mentioned but did not use. The way to proceed is, presumably, to estimate equation (1) as:

$$ln S_w = c + \alpha ln V + \varepsilon \tag{8}$$

where ε is the error term. However, note that the *accounting identity* (4) can be written as:

$$ln S_w \equiv 1 ln \theta + 1 ln V \tag{9}$$

If one now estimates (8) econometrically, one will encounter the insurmountable problem that expression (9), the *accounting identity*, indicates that $\alpha \equiv 1$. Econometrically, α can deviate from unity in expression (8) if the labour share (θ) displays a great deal of variation. In this case, the approximation of $ln\theta$ through the constant term c in (8) will be incorrect and will bias the estimate of the slope α. But this will occur only if factor shares vary a lot, much more than in actual data sets. For all practical purposes, no actual data set will refute the null hypothesis $\alpha = 1$. In other words, α will not take 'any' positive value, as Mazumdar claimed, but a value around one.

Table 2 shows estimation results of α according to equation (8). The point estimates are slightly different from unity because, as discussed, equation (8) assumes that factor shares are perfectly constant. However, as expected, statistically the estimates are not different from unity despite the fact that the shares display some variation (σ). The trouble boils down to the fact that expression (1), supposedly a behavioural relationship, cannot be used for testing purposes because, as we have shown, it cannot be refuted empirically. Note that expression (1) can be rewritten as $A = S_w / V^{\alpha}$, which is observationally equivalent with the *accounting identity* expression (4), and which implies $\alpha = 1$.

Table 1. *Decomposition of effects on the growth rate of real wages*

	Equation (6): $\dot{w} = \dot{\theta} + \alpha^{\star}\dot{v} - \dot{L} + (\alpha^{\star}\dot{P}p - \dot{P}c)$						Equation (2): $\dot{w} = \alpha\dot{v} - \dot{L} + (\alpha\dot{P}p - \dot{P}c)$			
	Real wage growth rate ($\dot{w}$)	$\alpha^{\star}$	Output effect ($\alpha^{\star}\dot{v}$)	Employment effect ($\dot{L}$)	Price effect ($\alpha^{\star}\dot{P}_p - \dot{P}_c$)	Labour share effect ($\dot{\theta}$)	α	Output effect ($\alpha\dot{v}$)	Employment effect ($\dot{L}$)	Price effect ($\alpha\dot{P}_p - \dot{P}_c$)
Korea										
1971	4.85	1	19.98	−1.62	−8.77	−7.99	0.68	13.50	−1.62	−10.28
1972	1.70	1	14.79	16.55	2.63	0.83	1.03	15.21	16.55	3.04
1973	19.45	1	37.25	18.84	8.37	−7.33	0.85	31.68	18.84	6.62
1974	3.88	1	12.49	13.10	1.77	2.71	1.07	13.37	13.10	3.61
1975	4.76	1	17.42	9.52	−4.91	1.77	1.05	18.23	9.52	−3.95
1976	10.90	1	26.82	21.12	0.90	4.29	1.10	29.50	21.12	2.52
1977	17.40	1	23.92	11.89	0.66	4.71	1.14	27.17	11.89	2.13
1978	20.84	1	29.34	9.99	−1.28	2.78	1.07	31.26	9.99	−0.42
1979	10.99	1	−4.29	0.21	1.03	14.47	1.97	−8.43	0.21	19.64
1980	−4.44	1	16.17	−3.40	−19.58	−4.44	0.82	13.33	−3.40	−21.18
1981	−1.66	1	13.72	−0.18	−6.97	−8.59	0.69	9.52	−0.18	−11.36
1982	4.57	1	6.87	2.55	−2.20	2.45	1.21	8.29	2.55	−1.17
1983	5.96	1	16.12	5.59	0.66	−5.24	0.74	11.94	5.59	−0.40
1984	9.15	1	15.96	5.75	−0.64	−0.41	0.98	15.58	5.75	−0.68
1985	4.67	1	7.94	4.02	−1.98	2.73	1.32	10.51	4.02	−1.83
1986	2.92	1	20.14	12.34	−0.39	−4.49	0.80	16.13	12.34	−0.86
1987	13.42	1	23.49	9.67	−3.14	2.74	1.12	26.24	9.67	−3.15
1988	11.76	1	11.72	3.91	−0.49	4.44	1.24	14.55	3.91	1.12
1989	17.58	1	9.35	−1.07	−1.73	8.89	1.67	15.60	−1.07	0.92
1990	9.57	1	25.10	−2.50	−5.43	−12.61	0.55	13.90	−2.50	−6.83
1991	10.97	1	12.54	−4.70	−1.56	−4.71	0.77	9.63	−4.70	−3.36
1992	8.22	1	8.19	−2.98	−3.05	0.10	1.01	8.26	−2.98	−3.02

Indonesia										
1971	15.22	1	52.23	4.76	−9.35	−22.89	0.52	26.96	4.76	−6.97
1972	28.33	1	27.16	20.90	20.63	1.44	1.03	27.88	20.90	21.35
1973	−5.40	1	11.92	1.31	−5.02	−10.99	0.71	8.44	1.31	−12.52
1974	1.87	1	5.59	−0.45	−22.70	18.54	1.79	10.01	−0.45	−8.58
1975	−0.64	1	11.95	14.60	−6.61	8.61	1.35	16.17	14.60	−2.21
1976	−0.33	1	15.11	12.55	−2.01	−0.88	0.97	14.71	12.55	−2.49
1977	8.16	1	8.63	−1.25	−1.07	−0.64	0.97	8.33	−1.25	−1.41
1978	9.38	1	14.77	3.73	5.88	−7.54	0.74	10.90	3.73	2.21
1979	6.95	1	4.44	5.24	5.68	2.07	1.08	4.78	5.24	7.41
1980	7.27	1	27.45	12.38	11.33	−19.13	0.66	18.21	12.38	1.45
1981	8.31	1	23.92	4.35	−9.12	−2.13	0.92	22.03	4.35	−9.37
1982	13.68	1	4.52	5.47	−4.85	19.47	3.13	14.13	5.47	5.01
1983	4.39	1	6.80	4.96	−5.23	7.78	1.58	10.76	4.96	−1.41
1984	−0.79	1	21.96	7.02	−1.90	−13.84	0.55	12.01	7.02	−5.78
1985	8.32	1	51.43	40.45	1.61	−4.27	0.93	47.63	40.45	1.14
1986	3.89	1	14.02	0.43	−4.41	−5.29	0.66	9.22	0.43	−4.89
1987	−0.22	1	9.69	5.80	1.99	−6.10	0.71	6.87	5.80	−1.29
1988	3.97	1	11.82	15.85	2.79	5.21	1.23	14.53	15.85	5.28
1989	4.42	1	26.78	9.18	−0.66	−12.53	0.62	16.48	9.18	−2.88
1990	−24.76	1	30.59	17.90	6.26	−43.70	0.02	0.66	17.90	−7.51
1991	5.60	1	6.81	12.52	1.89	9.41	1.52	10.35	12.52	7.76
1992	15.17	1	27.98	10.63	0.62	−2.80	0.92	25.82	10.63	−0.01

Table 2. *Econometric estimates of* α*, equation (8)*

Korea	1971–2000	1971–1980	1981–2000
α	0.9916 (75.47)	1.0955 (55.80)	0.9015 (36.28)
σ	0.0297	0.0294	0.0307
Indonesia	1971–1996	1971–1980	1981–1996
α	0.9190 (54.80)	1.0031 (32.57)	0.8376 (22.65)
σ	0.0425	0.0171	0.0464

Note: t-statistics in parentheses. σ is the standard deviation of the labour share. Estimation results of expression (9) are not shown for it is obvious that the slope of lnV is unity.

Summing up, Mazumdar's (2003) two methods for calculating the key parameter should be viewed as tautologies because the *accounting identity* that defines the labour share in value added leads to expressions identical to the one he obtains. From the labour share *accounting identity* we have derived an equation that decomposes the growth rate of the wage rate into an output effect, an employment effect, a price effect, and a labour share effect. However, this expression is simply an *accounting identity*. Imposing on it the (probable) empirically incorrect assumption that the labour share is constant leads to Mazumdar's equation. Moreover, when Mazumdar's supposed behavioural relationship defining the elasticity of the wage bill α is estimated econometrically, it becomes perfectly obvious that it cannot be distinguished from the labour share *accounting identity*, and which implies $\alpha = 1$ by definition. It thus follows that Mazumdar's decomposition of the growth rate of the real wage rate into the three effects, is incorrect even in his own terms, owing to the omission of the labour share effect. One could nevertheless ask whether despite the above, Mazumdar's decomposition of the growth of the wage rate is interesting in any sense and provides any useful information since, after all, decomposition exercises based on *accounting identities* are often used in economic analyses, e.g., the contribution to output growth of each of the components of the demand side of the economy (private consumption, government expenditures, etc.), is computed as the growth rate of the component multiplied by its share in output. While this is true and is certainly informative, the exercise does not have any behavioural content or policy implication. Moreover, to do this correctly in the current context, one should use the *accounting identity* equation (6), and not Mazumdar's equation (2).

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