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Briefing Paper

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TRADE DEFICITS AND MANUFACTURING JOB LOSS: CORRELATION AND CAUSALITY

by L. Josh Bivens

Between 2000 and 2003, annual manufacturing employment in the United States declined by almost 3 million jobs, and has been largely flat since then. The level of manufacturing employment in 2003 was 14.3 million, the lowest since 1950 (**Figure A**).

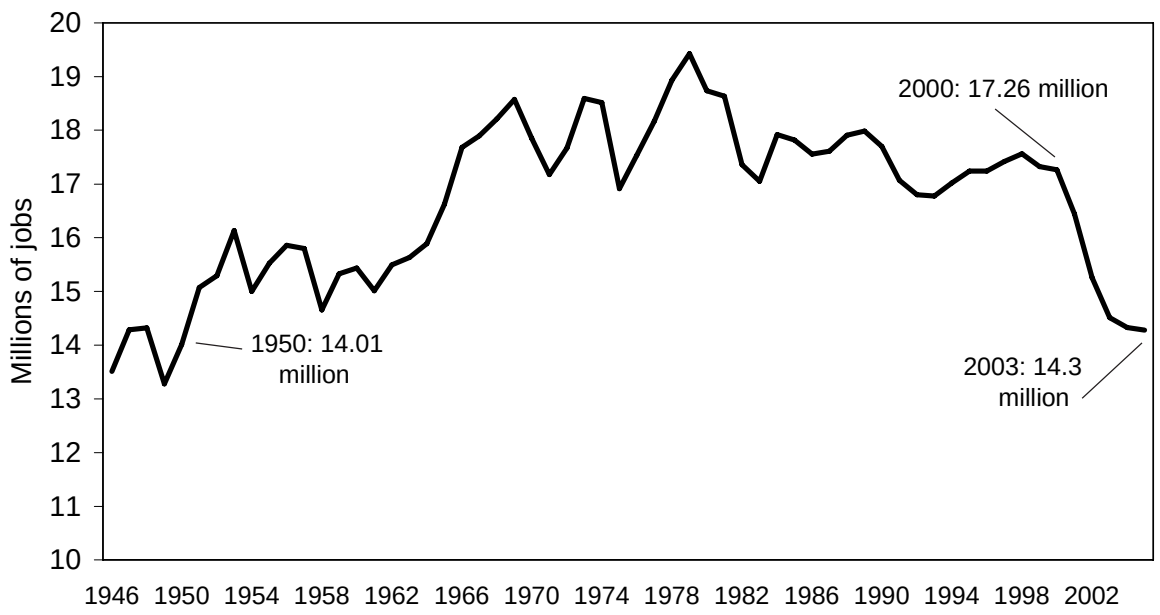
In addition, the trade deficit in manufactured goods rose by $84 billion between 2000 and 2003 and it is currently on pace to grow by another $150 billion by the end of 2005 (for a total deficit increase of $234 billion in the 2000-05 period).[1] The relationship between trade deficits in manufactured goods and manufacturing employment seems obvious: imports decrease labor demand in manufacturing while exports spur this demand. A rising trade deficit means, all else equal, that labor demand in U.S. manufacturing is reduced.

The importance of the simple relationship between trade deficits and employment in manufacturing is occasionally challenged. Two such challenges have recently garnered some press attention. The first comes from Martin Baily and Robert Lawrence, a former chair and member, respectively, of the Clinton Administration's Council of Economic Advisors (CEA). They argue in a Brookings Institution Paper on Economic Activity that trade deficits had only a minimal impact on manufacturing employment between 2000 and 2003. Even more provocative, Baily and Lawrence argue that rising imports actually *added* to U.S. manufacturing employment during this period.

The second challenge comes from Laura D'Andrea Tyson, another former chair of the

FIGURE A

U.S. manufacturing employment, 1946-present



Source: Bureau of Labor Statistics (BLS).

Clinton Administration's CEA. Tyson argues in a *Business Week* column that Germany, despite running large trade surpluses, has lost manufacturing jobs at a faster clip than the United States, implicitly arguing for the relative unimportance of trade flows in determining manufacturing employment.

This EPI analyis aims to once again clarify the relationship between trade deficits and employment in manufacturing, and reliably assess the importance of this relationship in explaining the U.S. manufacturing employment crisis. The central findings are:

- Properly measured, the rising trade deficit accounted for a significant part (over a fifth) of the job loss in manufacturing between 2000 and 2003.
- Job loss in U.S. manufacturing has proceeded faster than in its main developed country rivals in the recent past.

Trade, manufacturing jobs, and the effect of rising imports

Baily and Lawrence released a paper in late 2004 that asserted that the manufacturing job loss suffered between 2000 and 2003 was driven only minimally (about 12%) by a rising trade deficit. The essential results from Baily and Lawrence (2004) are summarized below in **Table 1** (taken directly from Table 4 in their original paper), which shows their estimates of the contribution of

TABLE 1
Table 4 from Baily and Lawrence (2004)

	Employment, total (millions)	Export-related employment (millions)	Import-related employment (millions)	Trade-related employment (millions)	Domestic use employment (millions)
2000	17.18	3.42	-4.94	-1.51	18.69
2003	14.32	2.69	-4.51	-1.82	16.15
	(e)	**Wx(x-v)**	**Wm(m-v)**	**Wt(t-v)**	**Wd(d-v)**
Changes	-2.85	-0.73	0.43	-0.31	-2.54
% contribution	100.0%	25.6%	-15.1%	11.0%	89.0%

Source: Baily and Lawrence (2004).

domestic use (demand), imports, and exports to manufacturing employment loss between 2000 and 2003.

The Baily and Lawrence results are surprising to many, implying not only that the manufacturing sector absorbed $80 billion more in net imports (about 6% of its entire value-added) in three years with minimal employment consequences, but also that the small rise in imports, contrary to expectations, actually *added* jobs to manufacturing. The authors bolster this impression later in the paper, asserting that:

> Only 12 percent, or 314,000 jobs [lost in manufacturing between 2000-03] are attributed to 'trade'. While the employment decline attributable to exports played a major role—accounting for 28 percent of the drop, or 742 thousand jobs, imports actually *offset* this fall by 429,000 and thus had a positive effect judged by this baseline (Baily and Lawrence 2004).

Can this all be true? Only under the very specific baseline methodology and presentation that Baily and Lawrence undertake. To be clear, what Baily and Lawrence have *not* done in Table 1 is show the impact of domestic use, exports, and imports on manufacturing employment. Rather, they have shown the impact of growth in domestic use *relative to productivity growth*, growth in exports *relative to productivity growth*, and growth in imports *relative to productivity growth*. This is a very different accounting exercise than estimating the net contribution of each factor of employment growth. They are clear about this earlier in the paper:

> In fact, we can decompose changes in employment into 3 elements: (a) changes due to productivity, (b) changes due to trade [imports and exports], and (c) changes due to domestic use. *Taking productivity as a given*, we can then ascribe employment changes to trade and domestic use. (ibid, emphasis added)

Appendix 1 shows the set of accounting relationships Baily and Lawrence use to derive the columns of Table 1. Although Baily and Lawrence express this in algebra, essentially they take the productivity growth that occurred between 2000 and 2003 as a given, and then ask: What had the biggest impact on employment *over and above the rate of productivity growth*—domestic use, exports, or imports? While this is a potentially interesting question, it does not provide a comprehensive overview of the influences that add to or subtract from manufacturing employment.

For example, one is told by reading Table 1 that domestic use (demand) contributed largely to employment loss between 2000 and 2003. Many readers probably assume that this means demand for manufactured goods fell between 2000 and 2003. It did not. It just didn't rise fast enough to make up for productivity growth. Further, while exports fell between 2000 and 2003, even if they had risen by 10% over this period, they would have made a negative "contribution" to employment growth according to Baily and Lawrence, since productivity growth ran at over 15%.

Lastly, the odd finding that imports "added to" employment is the reverse of this: as long as imports rose less quickly than productivity growth, they would always be expressed by Baily and Lawrence as a net "contributor" to employment. This is exactly what happened between 2000 and 2003: imports rose quite slowly (about 2%), but fell far behind productivity growth (15%), hence, were recorded by Baily and Lawrence as "adding" to employment growth. These numbers, again, are answering a very narrow question: *how much over and above productivity growth, did domestic use, exports, and imports contribute to employment growth?*

It is possible, however, to disentangle the effects of productivity from domestic use and trade to get a more transparent and accurate overview of the precise sources of manufacturing employment growth.[2] This is done below using data lifted directly from the Baily and Lawrence paper.

Appendix 2 relates the Baily and Lawrence methodology with the accounting relationship examined in the rest of this paper. Again, while appendix 2 expresses the relationship in algebra, the intuition is simple: the accounting relationship expressed below *separates out productivity growth* from other sources of employment change. It thus allows domestic use, trade, and productivity to each stand on their own as contributors to employment change, providing a much clearer picture of the "all else equal" impact of each.

$$e = w_d d + w_t t - v$$

Here, e is employment growth, d is growth in domestic use, t is growth in net exports (exports minus imports), and v is growth in productivity. The w terms show the weight of each of these relative to output in the base year (2000). **Table 2** shows the contribution of each of these to employment growth in U.S. manufacturing, using data directly lifted from the Baily and Lawrence paper.

Table 2 illustrates that domestic use, contrary to a possible impression gleaned from Table 1, actually *increased* between 2000 and 2003. Productivity (which doesn't appear in Table 1 because everything else is scaled to it) rose quickly during these three years, making the single most powerful contribution to employment loss.

TABLE 2
Manufacturing sources of employment change

	Employment (millions)	Wd* (%)	Wni** (%)	Domestic use (billions)	Net imports (billions)	Productivity (index)
2000	17.2	111.9%	11.9%	1,595.9	189.9	100.0
2003	14.3	115.6%	15.6%	1,610.1	251.2	115.3
2000-03				0.89%	32.26%	15.30%
Employment contribution				0.99%	-3.84%	-15.30%
Share of job loss				-5.47%	21.15%	84.32%

* Ratio of domestic use to domestic production
** Ratio of net imports to domestic production

Source: Author's calculations using data from Baily and Lawrence (2004).

The trade numbers are derived directly from the Baily and Lawrence calculations regarding the share of net exports in total manufacturing output—they estimate that the share of net trade flows in manufacturing output to be between 11.9% and 21.3% in 2000 and between 15.6% and 28.3% in 2003, depending on which precise measure of manufacturing output is used (Baily and Lawrence 2004, 224).

To be conservative, our analysis uses the lower number, which Baily and Lawrence themselves identify as an underestimate. Taking as given that net exports rose from 11.9% to 15.6% of manufacturing output between 2000 and 2003, this means that the contribution of *trade alone* (i.e., not scaled to productivity growth) to employment loss explains just over a fifth of total job loss, even using the conservative Baily and Lawrence numbers. Using the higher measures of trade's share of manufacturing output would boost the implied contribution of trade to manufacturing job loss to closer to a third.

Note that new data allow this calculation to be done for the 2000-04 period as well. Between 2003 and 2004, manufacturing lost an additional 181,000 jobs, the trade deficit grew by $87 billion, productivity rose 5%, and domestic production rose by 2%. These new numbers imply that the manufacturing trade deficit could explain at least a third of manufacturing job loss from 2000 to 2004.

What's the question again?

Again, to be clear about what is different between Tables 1 and 2: Table 1 measures the contribution of domestic use, imports, and exports *all scaled relative to productivity*, while Table 2 disentangles productivity growth from the other factors and allows each determinant of employment change to stand on its own. There is absolutely no substantive difference in these estimates except

for this demonstration aspect.

Both Tables 1 and 2 are "correct" in measuring what they claim to measure. Deciding which is more useful depends on the precise question posed. Table 1 is more useful for answering: "Given 12% productivity growth between 2000 and 2003, was the growth of domestic use (or exports, or imports) sufficient to spur positive employment growth?"

Table 2 best answers the question: "How much of the employment loss suffered in U.S. manufacturing between 2000 and 2003 was caused by domestic use, trade, and productivity?" This table shows that domestic use made a modest positive contribution, trade explained at least a quarter of employment change, and productivity explained the rest. The trade number in this presentation is much larger than that identified by Baily and Lawrence.

Is everybody losing jobs as fast as the United States?

In a recent *Business Week* column, Laura D'Andrea Tyson (2005) argues that Germany has lost manufacturing jobs at a faster clip than the United States in the recent past, despite having a large trade surplus. She uses this point to argue that "…a trade surplus in manufactured goods would not necessarily translate into job gains."

Tyson is correct in asserting that there are many influences on manufacturing employment besides the trade deficit. Germany, for example, saw domestic demand grow less than one-tenth as fast as the United States between 2000 and 2003. And, if the United States saw domestic demand wither at the same time as the manufacturing deficit decreased, then it may not see employment gains.

Tyson is also correct in asserting that the rising trade deficit is not the primary driver of manufacturing job loss in the United States. However, it is only true that Germany has lost more manufacturing jobs than the United States if the data analysis is restricted to the years between 2002 and 2004. The United States has lost far more jobs, both in raw numbers and as a percentage, since 2000 (**Table 3**).

Further, and most fundamental, it is undeniable that the "all else equal" effect of manufacturing trade deficits (surpluses) is employment losses (gains), and that manufacturing trade flows have made a much larger contribution to U.S. manufacturing employment loss than Tyson acknowledges. While Germany has lost manufacturing jobs even in the face of a rising trade surplus (because of weak domestic demand), it is undeniable that the job loss *would have been greater* without the rising surplus. Just because manufacturing employment is influenced by many separate factors does not mean that the importance of each factor is unknowable. Manufacturing deficits cause manufacturing losses in both the United States and Germany.

Conclusion

Productivity growth has played the most important role in manufacturing job loss in the recent past, but this growth is to be welcomed over the long-run, as productivity provides the ceiling on

TABLE 3
Manufacturing employment (in millions)

	United States	Canada	Australia	Japan	Germany
2000	19.64	2.25	1.13	13.18	8.65
2001	18.43	2.23	1.10	12.80	8.63
2002	17.23	2.29	1.11	11.99	8.49
2003	16.90	2.28	1.09	11.75	8.25
2004	16.48	2.30	1.09	11.47	8.09
2000-03	-2.74	0.03	-0.04	-1.43	-0.40
2000-04	-3.16	0.04	-0.04	-1.71	-0.56
percent change					
2000-03	-14.0%	1.3%	-3.9%	-10.8%	-4.6%
2000-04	-16.1%	1.9%	-3.2%	-13.0%	-6.4%

* Note that these figures are derived from household surveys. The U.S. employment numbers presented in Figure A are derived from establishment surveys, hence the difference between those and the present numbers. The establishment is better for getting counts of U.S. employment, but the household survey provides for better international comparisions, hence this is what is used by the BLS in their foreign labor statistics program.

Source: Bureau of Labor Statistics (BLS) foreign labor statistics program.

how quickly living standards can rise. Productivity growth, in short, is not a problem.

What is a problem, however, is slow demand growth for manufactured goods. Demand for manufactured goods can come from domestic use or net exports. In recent years in the United States, these combined sources of demand have been far too weak to generate employment in manufacturing. Yet contrary to impressions that may be gleaned from reading Tyson and Baily and Lawrence, negative net exports have provided an outright drag on employment growth, while domestic demand has risen (albeit rather sluggishly). Moving the contribution of net exports from negative to positive would greatly spur job growth in U.S. manufacturing.

Appendix 1

Baily and Lawrence (2004) start with the basic relationship that domestic output (Q) is equal to domestic use (demand, or, D), plus exports (X), minus imports (M):

$$(1)\ Q = D + X - M$$

Next, Baily and Lawrence present the identity defining labor productivity (V) as the quotient of output (Q) divided by employment (E):

$$(2)\ V = Q/E$$

Which, re-arranged, shows that employment (E) is equal to output (Q) divided by productivity (V):

$$(3)\ E = Q/V$$

Combining (1) and (3) yields:

$$(4)\ E = D/V + X/V - M/V$$

This is the cornerstone of the Baily and Lawrence methodology. Expressed in growth rates (shown here as lowercase letters), this gives the following expression for employment change:

$$(5)\ e = w_d(d-v) + w_x(x-v) - w_m(m-v)$$

Here, w is the share of domestic use, exports, or imports relative to total output in the base year (2000) while lowercase letters, again, register growth rates of each variable. In Table 1, the column for "domestic use" in Baily and Lawrence is actually measuring the contribution of: $w_d(d-v)$ to employment change, or growth in domestic use (d) *minus productivity growth* (v). The same holds for columns labeled "exports" and "imports." Exports and imports can be combined to show the impact of net trade on employment:

$$(6)\ e = w_d(d-v) + w_t(t-v)$$

Where $t = (x-m)$ and $w_t = w_x - w_m$

Appendix 2

There is a simpler way to go about measuring the contributions of each of the relevant determinants of employment growth (domestic use, exports, imports, and productivity). Look again at expression (6) from Appendix 1. Now, note that:

$$(7)\ (w_d + w_t) = 1$$

This implies the following transformation, from (5) and (6):

$$(8)\ e = w_d d + w_t t - v$$

Here, $w_d d$ is the contribution of growth in domestic use to employment growth (e), $w_x x$ is the contribution of growth in exports to e, $(-w_m m)$ is the contribution of growth in imports to e, and, lastly, v is the contribution of productivity growth to growth in e.

Note, this is absolutely identical in all respects to the Baily and Lawrence expression—it has just been expanded for a more transparent presentation. The elements on the right-hand side of (8) (see the equation on page 4) correspond to the columns of Table 2.

Endnotes

1. This Briefing Paper will focus primarily on 2000-03, as this is the period examined by other authors.

2. Bivens (2004) undertakes a near-identical accounting decomposition of the sources of employment change in manufacturing between 2000 and 2003, and comes to the conclusion that rising trade deficits explain about a third of the manufacturing job loss over this period, about identical to what the Bailu and Lawrence numbers show.

References

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