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Ritisha Chittoor
Paul Pietraru
Andrew Sharpe

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The Stylized Facts of the United States Manufacturing Productivity Slowdown

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Abstract

This report investigates recent trends in productivity growth within the U.S. manufacturing sector, highlighting a significant and persistent slowdown. By evaluating compound annual growth rates, we found that growth in manufacturing fell from 3.75 per cent over 1997-2011 to -0.51 per cent over 2011-2023, the largest slowdown of any two-digit NAICS sector. Using two- and three-digit NAICS data, this report first situates manufacturing within the broader private business sector and then aims to identify the specific industries contributing most to the sector's underperformance. The manufacturing productivity growth slowdown was broad-based**,** but a few industries accounted for most of the aggregate decline. Comparative analysis with peer economies highlights that the U.S. manufacturing productivity slowdown has been particularly severe by international standards. Given manufacturing's historical importance as a driver of productivity growth, its considerable scale, and its extensive inter-industry linkages, this slowdown has had broad implications for the wider private business sector. This report explores several potential explanations, including diminishing returns to technological innovation, structural shifts across industries, reduced R&D effectiveness, and the persistent effects of the Great Recession. It also considers broader constraints such as offshoring, stagnating capital intensity, and challenges related to productivity measurement.

The Stylized Facts of the United States Manufacturing Productivity Slowdown

Executive Summary

This report presents a comprehensive analysis of the significant and persistent productivity growth slowdown since 2010 in the U.S. manufacturing sector, a sector that has historically been a driver of productivity growth and pivotal to economic innovation and output. The study compares two distinct periods (1997-2011 and 2011-2023) to understand this trend. Section I begins by exploring the motivations for this report and the importance of examining manufacturing productivity. Next, Section II and III deconstruct labour productivity, levels and growth, into its constituents (i.e. output, hours worked, and total factor productivity) to explain recent trends. Section IV delves deeper into growth accounting to further examine trends in labour productivity growth and changes in total factor productivity. Section V situates the U.S. manufacturing industry within an international context to examine the severity of the slowdown. Section VI examines potential explanations by decomposing labour productivity growth in the manufacturing sector. Section VII synthesizes the relevant literature. Finally, section VII concludes by providing a review of the relevant findings.

For both labour productivity and total factor productivity, the Bureau of Labour Statistics (BLS) uses real value-added output for the overall private business sector and real sectoral output for industries at the 2- and 3-digit NAICS levels. In contrast, the Bureau of Economic Analysis (BEA) reports only real value-added output at every level. When referring to manufacturing productivity in this report, we default to the BLS estimates unless otherwise stated.

The private business sector's average annual productivity growth fell from 2.75% in 1997-2011 to 1.47% in 2011-2023—a decline of 1.28 points. The manufacturing sector had a relative contribution of approximately -0.54 (or 42.4 per cent) to the overall slowdown in labour productivity growth in the private business sector. While output growth accelerated modestly in the private business sector, manufacturing experienced a significant deceleration.

- Labour productivity growth in the manufacturing sector collapsed from an annual average rate of change of 3.75 per cent in 1997-2011 to -0.51 per cent in 2011-2023, a decline of 4.27 percentage points. In contrast, labour productivity in the private business sector slowed from 2.75 per cent to 1.47 per cent, a 1.28 percentage point difference.
    - Manufacturing was one of only 5 out of 19 two-digit NAICS industries within the private business sector to record negative labour productivity growth during 2011–2023.
    - The 4.27 percentage point decline represents the largest drop among all two-digit NAICS industries in the private business sector.
    - Notably, during 1997–2011, manufacturing ranked third among the two-digit NAICS industries in terms of labour productivity growth (only behind the wholesale trade and information sectors) at 3.75 per cent per year.

- Manufacturing sectoral output growth fell from 0.81 per cent in 1997–2011 to 0.12 per cent in 2011–2023, a deterioration of 0.69 percentage points. By contrast, output growth in the private business sector accelerated from 2.57 per cent to 2.93 per cent, an increase of 0.36 percentage points.

- Growth in hours worked in manufacturing rose from -2.84 per cent in 1997-2011 to 0.63 per cent in 2011-2023, representing an increase of 3.47 percentage points. In the private business sector, the hours worked CAGR rebounded from -0.18 per cent to 1.42 per cent, representing a smaller increase of 1.60 percentage points.

- Growth in TFP of manufacturing turned negative, falling from 1.38 per cent in 1997-2011 to -0.35 per cent in 2011-2023—a deterioration of 1.73 percentage points. In comparison, private business TFP growth declined from 1.14 per cent to 0.73 per cent, a difference of 0.41 percentage points. The manufacturing sector accounted for approximately 87.5 per cent of the slowdown in private business sector TFP growth.

The manufacturing labour productivity slowdown was widespread, with 18 out of 19 three-digit NAICS industries experiencing a slowdown in labour productivity growth between the two periods. Additionally, 15 out of 19 of the three-digit NAICS industries recorded negative labour productivity growth during the ladder period. A closer examination of the manufacturing industries reveals that industries which bolstered growth in 1997-2011 largely drove the slowdown.

- Computer and Electronic Products: CAGR in labour productivity declined from 9.44 per cent to -0.31 per cent—a drop of 9.74 percentage points. This industry made an estimated 21 per cent relative contribution to the overall manufacturing labour productivity slowdown.

- Transportation Equipment: CAGR in labour productivity for motor vehicles, bodies and trailers, and parts declined from 4.40 per cent to -0.43 per cent, a drop of 4.84 points. For other transportation equipment, labour productivity CAGR fell 4.24 points, from 2.71 per cent to -1.53 per cent. These drops represented 7.03 per cent and 5.74 per cent of the total slowdown, respectively.

- Apparel, Leather, and Allied Products: This was the only industry to show an improvement in labour productivity, increasing from a CAGR of -2.37 per cent to 1.82 per cent, a positive shift of 4.19 percentage points.

Although most OECD countries also experienced a drop in manufacturing productivity growth between the two periods analyzed, that of the U.S. appeared particularly severe when compared to international peers. In terms of the percentage point slowdown, the U.S. placed in the bottom quartile of performance rankings in all data samples examined. The OECD data confirmed this pattern, with the U.S. registering a 4.27 percentage point decline between 1997-2011 and 2011-2023 compared to an average drop of 2.1 point among the 30 nations listed.

- Post-2011 U.S. manufacturing productivity growth lagged that of peer economies such as Denmark, United Kingdom, Germany, and France, according to EUKLEMS and OECD

data. In the EUKLEMS, the U.S. ranked 27 out of the 29 countries listed, while in the OECD data, it ranked 26 out of the 31 countries listed.[1]

- 24 out of 29 countries in the EUKLEMS dataset experienced slower manufacturing productivity growth after 2011.

The report identifies several interconnected factors driving the U.S. manufacturing productivity slowdown:

Sectoral analysis performed by the CSLS for 1997-2011 identifies within-industry productivity effects (reflecting the pure change in productivity across industries keeping labour shares constant) as having dominated the slowdown, contributing -15.48 out of the -12.85 aggregate decline in chained 2017 dollars. The other term, representing labour reallocation, worked against the slowdown, indicating that labour reallocated to more productive sectors.

One key reason for the slowdown may have been the diminishing returns to technological innovation associated with the end of the IT boom. Computers and Electronic Products, once the primary engine of productivity growth for the manufacturing sector, saw a notable slowdown, particularly in sub-industries like semiconductors. After decades of driving performance through rapid innovation, the pace of productivity gains has significantly diminished, suggesting that many of the most impactful technological advances have already been realized.

Despite continued growth in R&D intensity, productivity growth in U.S. manufacturing has stalled, suggesting that R&D may have become less effective in driving output gains. At the same time, some studies have found that the U.S. lagged others in the adoption of advanced manufacturing technologies, particularly among smaller firms. A decline in firm responsiveness to innovation, especially in high-tech sectors, may reflect weakening competitive pressures. As a result, productivity gains have become increasingly concentrated among a small group of leading firms, while many others struggle to keep pace.

The lingering effects of the Great Recession posed persistent challenges, as evidenced by studies showing that capital stock growth rates remained below pre-crisis trends. In addition, cyclical disruptions such as the COVID-19 pandemic may have exacerbated long-standing structural issues, with supply chain interruptions and the automotive sector failing to regain its previous productivity trajectory.

Research has found that capital intensity growth in U.S. manufacturing slowed significantly in the 2000s and nearly stalled in the 2010s, reflecting prolonged underinvestment in new equipment and infrastructure. While a few industries sustained steady growth, sectors such as electronics and vehicle manufacturing experienced sharp declines. This trend has been linked to a broader shift in investment toward intangible assets like software and R&D, which has diverted resources away from traditional capital expenditures. In addition, weakened competitive pressures, common ownership structures, and corporate practices prioritizing short-term shareholder returns (such as stock buybacks) have further discouraged long-term investment.

[1] Since no U.S. labour productivity data was provided by the OECD dataset, we used the BEA value-added number.

Research suggests that offshoring and structural changes may have contributed to the slowdown in U.S. manufacturing productivity. The increasing separation of R&D from domestic production—especially in sectors like battery and semiconductor manufacturing—may have weakened the conditions for sustained innovation. In pharmaceuticals, productivity declines appear to be linked to the offshoring of active ingredient production and the expiration of major patents. Broader shifts in global trade, including rising import competition, may have reduced output growth, which in turn limited incentives for capital investment and the adoption of new technologies. As higher-productivity industries contracted and lower-productivity ones became more prominent, overall productivity growth in the sector slowed. The decline in domestic production may also have created a less supportive environment for innovation.

Measurement challenges present ongoing questions about the true scale of the slowdown. Some researchers suggest conventional metrics may understate quality improvements in high-tech sectors, while others argue rising markups may actually exaggerate the measured productivity declines.

The Stylized Facts of the United States Manufacturing Productivity Slowdown

Section I: Introduction[2]

This report investigates productivity trends within the U.S. manufacturing sector, highlighting a significant growth slowdown and its implications for the broader private business economy. The motivation for this study is to understand this trend and to explore the factors contributing to the underperformance of U.S. manufacturing in terms of productivity, particularly given the sector's scale, its extensive linkages across industries, and its historical role as a key driver of economic growth. Given the strong productivity performance in the U.S. aggregate economy, the recent weakness in manufacturing is not well known, appreciated, and understood.

The performance of the U.S. manufacturing sector has traditionally been viewed as a key indicator of the country's economic strength. As one of the most industrially diversified and technologically advanced economies globally, the U.S. has historically relied on manufacturing to support productivity growth, technological development, and labour market opportunities. Throughout much of the 20th century, the sector played a significant role in shaping the U.S. economic landscape through its contributions to output, exports, and innovation. In recent decades, however, the sector has experienced extremely poor productivity performance, both in absolute terms and relative to its historical trend; it has undergone notable structural changes, prompting renewed interest in its evolving function within the broader economy. Despite relatively robust overall productivity growth in the U.S. private business sector, manufacturing has experienced a productivity growth slowdown since the 2010s. This divergence is noteworthy given the sector's longstanding contribution to aggregate productivity and its position as one of the largest industries by both output and employment. The underperformance of manufacturing in recent years has, as a result, had an outsized effect on overall productivity dynamics.

To investigate this, the report conducts a detailed empirical analysis of productivity trends in U.S. manufacturing, focusing on two distinct time periods: 1997–2011 and 2011–2023. The choice of 2011 as a dividing line reflects a clear turning point in sectoral performance, following which a sustained deceleration in labour productivity growth became evident. We first situate manufacturing within the wider U.S. private business economy, comparing productivity trends across industries using indicators such as output, hours worked, labour productivity, and total factor productivity (TFP).[3] We then turn to a more focused analysis of the manufacturing sector itself, analysing three-digit NAICS subsectors to identify the primary contributors to the productivity growth slowdown. The analysis is extended to an international context, benchmarking U.S. manufacturing performance against other advanced economies using data from The Conference Board, the OECD, and EUKLEMS. The report also examines a range of potential

[2] This paper was prepared by CSLS co-op students Ritisha Chittoor and Paul Pietraru, together with Andrew Sharpe (Executive Director, CSLS). On May 30, 2025, it was presented at the CSLS session "Perspectives on Productivity" at the annual meeting of the Canadian Economics Association at UQAM in Montreal. We thank Alexander Amundsen (IMF) for his diligent comments as discussant. Email: andrew.sharpe@CSLS.ca.

[3] All data used in the construction of this paper can be found in the appendix database on the CSLS website.

explanations for the slowdown, including sectoral shifts, the end of the IT boom, the diminishing returns to technological innovation, changes in R&D, rising market power, and the lasting effects of the Great Recession.

Choice of Time Periods for Analysis

Table 1: Time Period Sensitivity Analysis

Panel A: Labour Productivity CAGR

Private Business Sector		
1997-2008	2008-2023	Difference
2.83	1.67	-1.16
1997-2009	2009-2023	Difference
2.96	1.47	-1.49
1997-2010	2010-2023	Difference
2.99	1.33	-1.66
1997-2011	2011-2023	Difference
2.75	1.47	-1.28
1997-2012	2012-2023	Difference
2.61	1.54	-1.07

Manufacturing Sector		
1997-2008	2008-2023	Difference
4.01	0.15	-3.86
1997-2009	2009-2023	Difference
3.78	0.06	-3.72
1997-2010	2010-2023	Difference
3.98	-0.41	-4.39
1997-2011	2011-2023	Difference
3.75	-0.51	-4.26
1997-2012	2012-2023	Difference
3.42	-0.45	-3.87

Panel B: Total Factor Productivity CAGR

Private Business Sector		
1997-2008	2008-2023	Difference
1.23	0.75	-0.48
1997-2009	2009-2023	Difference
1.16	0.78	-0.38
1997-2010	2010-2023	Difference
1.26	0.64	-0.62
1997-2011	2011-2023	Difference
1.14	0.73	-0.41
1997-2012	2012-2023	Difference
1.11	0.74	-0.37

Manufacturing Sector		
1997-2008	2008-2023	Difference
1.78	-0.29	-2.07
1997-2009	2009-2023	Difference
1.33	-0.06	-1.39
1997-2010	2010-2023	Difference
1.52	-0.35	-1.87
1997-2011	2011-2023	Difference
1.38	-0.35	-1.73
1997-2012	2012-2023	Difference
1.2	-0.26	-1.46

Source: Bureau of Labor Statistics (1) and (2)

The report integrates sector and industry-level data, macroeconomic context, and international comparisons to provide a comprehensive account of the U.S. manufacturing productivity growth slowdown. In doing so, it aims to offer valuable insights into the dynamics of U.S. manufacturing productivity and its implications for future economic performance, while also providing essential foundational knowledge to inform the development of more effective public policies and private sector strategies to enhance the sector's productivity.

The time periods chosen for the analysis in this report are 1997-2011 and 2011-2023, and our primary focus is on comparing compound annual growth rates (CAGRs) between these periods. To avoid the cyclical effects following the Great Recession, we omit using 2010 as our dividing year, even though it is the year which shows the largest falloffs based on time series data from the

Bureau of Labor Statistics (as seen in Table 1). The year 2011 marks a key turning point, just before the onset of a noticeable slowdown in productivity growth in the following years but far enough from the influences of the Great Recession. This makes it an important reference point for understanding evolving productivity trends.

Initially, the analysis was structured to compare the periods 1987-2011 and 2011-2023. However, for some additional calculations and estimates in this report, the CSLS utilised time series data on value-added output from BEA for which data was only available from 1997 onward. To ensure consistency across all calculations, we adjusted the first time period to 1997-2011, while retaining 2011 as the dividing year between the two periods. This adjustment allows us to align the data from both the BLS and the BEA and ensures that all subsequent analysis is based on the most accurate and complete data available.

By comparing the two periods, we aim to provide a clear picture of productivity changes and trends in the U.S. private business sector, particularly in the manufacturing industry, while ensuring consistency in the data used for analysis.

Section II: Productivity Analysis of United States Private Business Sector

In this section of the report, we analyze the U.S. private business sector which includes privately owned, profit-driven establishments and excludes government enterprises. This approach facilitates an examination of manufacturing within the broader context of the overall economy (which is predominantly comprised of the private business sector) and two-digit NAICS industries. Given the sector's significant role in the economy, understanding its productivity trends provides valuable insights into structural economic changes over time.

Our analysis is based on six tables created using datasets from the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA). We first analyze sectoral output produced by the BLS, followed by real value-added output produced by the BEA. We then look only into hours worked sourced by the BLS. Next, we examine labour productivity (defined as output per hour worked) using both BLS estimates, which are based on sectoral output, and CSLS estimates, which are based on real value-added output from the BEA. Finally, we assess BLS estimates of total factor productivity to gain deeper insights into the efficiency of input utilization across industries. For both labour productivity and total factor productivity, BLS uses real value-added output for data on the private business sector but relies on real sectoral output for data on two-digit NAICS industries.

The key focus of our analysis is the manufacturing sector, given its significant influence on overall productivity trends. However, we also explore other relevant industries that provide meaningful contributions to our understanding of productivity dynamics within the private business sector. By examining these different productivity measures and comparing their performance to manufacturing, we aim to capture a more nuanced picture of economic performance, structural shifts, and sector-specific challenges over the past two decades in the private business sector.

Output

Sectoral Output

This analysis examines sectoral output as reported by the BLS. Sectoral output is a measure which lies between gross output and value-added output. It is defined as an industry's gross output less only those intermediate inputs that are produced within that industry or sector (i.e., intrasectoral transactions); it may be considered close to gross output as most inputs are purchased across sectors.

As seen in Table 2, growth in (real value-added output) for the total private business sector experienced an overall acceleration in the period 2011-2023 compared to the 1997–2011 period. The CAGR for 1997–2011 was 2.57 per cent, which increased to 2.93 per cent in the following period, resulting in a positive percentage point difference of 0.36. This suggests that despite economic fluctuations such as the COVID-19 pandemic, the private business sector as a whole has sustained and even improved its output growth in the last decade. In contrast to the broader business sector, manufacturing has experienced a significant slowdown—contributing more to the slowdown than any other sector.

Table 2: Two-Digit NAICS Industries Sectoral Output Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change Between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current sectoral output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(0.36)
Private Business Sector	2.57	2.93	0.36	100.00	0.36	100.0
Agriculture, forestry, fishing, and hunting	0.64	0.15	-0.49	1.82	-0.01	-2.4
Mining	0.79	4.21	3.42	2.23	0.08	21.2
Utilities	-0.30	0.40	0.70	2.71	0.02	5.3
Construction	-1.17	2.71	3.88	5.37	0.21	57.9
Manufacturing sector	**0.81**	**0.12**	**-0.69**	**20.75**	**-0.14**	**-40.0**
Wholesale trade	3.59	2.25	-1.34	6.97	-0.09	-26.0
Retail trade	1.90	3.56	1.66	6.15	0.10	28.3
Transportation and warehousing	1.88	2.33	0.45	4.06	0.02	5.1
Information	4.85	5.76	0.91	5.85	0.05	14.7
Finance and insurance	3.23	1.74	-1.49	7.90	-0.12	-32.6
Real estate and rental and leasing	2.47	3.68	1.20	7.30	0.09	24.4
Professional, scientific, and technical services	3.29	4.34	1.04	8.00	0.08	23.2
Management of companies and enterprises	2.25	4.49	2.24	2.35	0.05	14.6
Administrative and waste management services	2.99	3.77	0.78	3.53	0.03	7.7
Educational services	5.86	1.01	-4.85	0.97	-0.05	-13.1
Health care and social assistance	3.61	2.96	-0.65	7.47	-0.05	-13.5
Arts, entertainment, and recreation	1.95	3.46	1.51	1.01	0.02	4.2
Accommodation and food services	1.98	2.71	0.73	3.28	0.02	6.7
Other services, except government	0.66	2.71	2.06	2.31	0.05	13.2

Source: Bureau of Labor Statistics (1) and (2)

Notes:

- The percentage share of current sectoral output in 2011 is calculated by taking each sector's sectoral output as a share of the sum of sectoral output for all sectors. Sectors with more intersectoral linkage will see their share overestimated and vice versa.
- The private business sector output reported by the BLS uses real value-added output as sectoral output does not apply to the entire private business sector.

The CAGR for manufacturing dropped from 0.81 per cent in 1997–2011 to 0.12 per cent in 2011–2023, marking a percentage point decline of -0.69. As the largest two-digit NAICS industry, manufacturing accounted for 20.75 per cent of total private business sector output in 2011. However, its stagnation has had a substantial impact, with a relative contribution of -0.14 points (or -40.0 per cent) to the overall acceleration in private business sector output growth.[4] Here, the change in manufacturing's growth rate reflects the second derivative—the change in the rate of change—indicating its negative contribution to the overall growth acceleration. This underscores manufacturing's outsized role in constraining further acceleration of the private business sector, even as other industries expanded.

In contrast to manufacturing, the construction industry saw a dramatic recovery. From a negative CAGR of -1.17 per cent in 1997–2011, the growth of output in this industry surged to 2.71 per cent in 2011–2023, marking a 3.88 percentage point increase—the highest among all two-digit industries. With a 5.37 per cent share of total private business sector output in 2011, this resulted in a relative contribution of 0.21 points (or 57.9 per cent) to the acceleration in private business sector output growth. This resurgence was likely tied to infrastructure investments, increased housing demand, and post-recession recovery in real estate markets.

A major negative shift was also observed in the finance and insurance sector. Between 1997 and 2011, the sector had a strong CAGR of 3.23 per cent, but this fell sharply to 1.74 per cent in the 2011–2023 period, resulting in a percentage point decline of -1.49. With finance and insurance accounting for 7.90 per cent of total private business sector output in 201, its relative contribution was -0.12 points (or -32.61 per cent)—the second-largest negative contribution to the acceleration in overall output growth. This decline is likely attributable to regulatory tightening following the 2008 financial crisis, which constrained risk-taking, as well as prolonged periods of low interest rates that reduced profitability and slowed sectoral expansion.

Value-Added Output

To provide another perspective on for real output by two-digit NAICS industries, this analysis also examines value-added output using data retrieved from the Bureau of Economic Analysis (BEA). Value-added output is a more narrowly defined concept that excludes the value of all purchased intermediate inputs from gross output.

As exhibited in Table 3, the growth rate of real value-added output in the total private business sector experienced a modest increase from the 1997–2011 period to the 2011–2023 period.

[4] Column five (of the tables in sections II and III) report each industry's contribution to the aggregate change by applying the column four weight to its growth rate. The contributions need not sum to the aggregate growth rate for four reasons. First, the real series are chain-linked indexes, which are not additive. Second, industry shares of output (or hours in later tables) vary over time; using a single year's weight misstates contributions. Using 2023 would overstate industries that have grown and understate those that have shrunk, with the opposite pattern if 1997 were used. We therefore use the midpoint year, 2011. Third, sectoral output can change simply because interindustry linkages within manufacturing expand or shrink, not because true output increases. Fourth, in Section II the private business sector total is measured in real value added, while two-digit NAICS sectors are measured as sectoral output that includes inputs from other two-digit sectors; in Section III the overall manufacturing sector's measure includes inputs from other two-digit sectors, while three-digit industries include inputs from other two- and three-digit industries. Only the first two issues apply to the tables that use BEA real value added. Despite these limitations, the figures still provide useful, high-level insight into manufacturing trends.

Table 3: Two-Digit NAICS Industries Value-Added Output Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current value-added output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(0.16)
Private Business Sector	2.52	2.68	0.16	100.00	0.16	100.0
Agriculture, forestry, fishing, and hunting	2.04	2.10	0.06	1.34	0.00	0.5
Mining	1.39	4.13	2.73	2.66	0.07	45.8
Utilities	1.41	1.07	-0.34	2.14	-0.01	-4.6
Construction	-1.63	1.98	3.61	3.90	0.14	88.8
Manufacturing sector	**2.56**	**1.39**	**-1.17**	**13.84**	**-0.16**	**-102.2**
Wholesale trade	2.57	1.13	-1.43	6.94	-0.10	-62.8
Retail trade	2.05	2.97	0.91	6.56	0.06	37.8
Transportation and warehousing	1.25	2.51	1.26	3.36	0.04	26.6
Information	6.32	7.36	1.04	5.67	0.06	37.1
Finance and insurance	3.10	1.27	-1.83	7.60	-0.14	-87.7
Real estate and rental and leasing	2.91	2.35	-0.56	15.29	-0.09	-53.9
Professional, scientific, and technical services	3.48	4.91	1.43	8.37	0.12	75.6
Management of companies and enterprises	0.74	5.78	5.04	2.06	0.10	65.7
Administrative and waste management services	3.48	3.19	-0.30	3.38	-0.01	-6.3
Educational services	3.01	0.63	-2.38	1.53	-0.04	-23.0
Health care and social assistance	3.02	2.94	-0.08	8.54	-0.01	-4.3
Arts, entertainment, and recreation	1.92	2.39	0.47	1.18	0.01	3.5
Accommodation and food services	1.54	1.84	0.31	3.14	0.01	6.0
Other services, except government	-1.08	0.54	1.62	2.48	0.04	25.3

Source: Bureau of Economic Analysis

Notes:

- Dataset on real value added by industry (in billions of 2017 chained dollars) is sourced from the BEA.
- The BEA uses the term 'Private Industries' to refer to all industries within the Private Business Sector.

The compound annual growth rate (CAGR) increased from 2.52 per cent to 2.68 per cent respectively, reflecting a minor percentage point difference of 0.16. This difference was less than half of that reported by the BLS in Table 3. Regardless, while growth has continued, the overall pace of expansion has only slightly improved in the past decade.

Manufacturing has experienced a pronounced value-added output growth slowdown. Its CAGR declined from 2.56 per cent in the first period to 1.39 per cent in the latter period, marking a steep percentage point drop of 1.17. In 2011, manufacturing accounted for 13.84 per cent of total private business sector value-added output, making it the second-largest two-digit NAICS industry in terms of value-added output behind real estate, rental and leasing.[5] Yet, its output growth deceleration significantly constrained overall private sector growth, translating to a -0.16 point (or -102.2 per cent) relative contribution to the total private business sector's growth increase.

In contrast to manufacturing's deceleration, the construction industry rebounded sharply, showing the strongest positive contribution (to the change in output) of any sector. From a negative CAGR of -1.63 per cent in 1997–2011, its real value-added output growth surged to 1.98 per cent in 2011–2023, reflecting an impressive 3.61 percentage point increase. Although construction accounted for a smaller 3.90 per cent share of total private business sector output, its relative contribution to the acceleration reached 0.14 points (or 88.8 per cent)—the highest positive influence among all two-digit industries. The calculations representing relative contributions may appear inflated due to the small base used (i.e. the change in growth between periods for the private business sector). Even so, they effectively illustrate the industry's significant role to the overall acceleration in value-added output growth when compared to the other sectors.

The finance and insurance sector experienced the second most significant slowdown in terms of its relative contribution, as was also the case in the sectoral output analysis. Its CAGR plummeted from 3.10 per cent (1997–2011) to 1.27 per cent (2011–2023), a percentage point decline of -1.83. With a 7.60 per cent share of total private business sector output in 2011, its relative contribution to the increase in value-added output was -0.14 (or -87.69 per cent)—the greatest negative percentage among all two-digit industries.

On the opposite end of the spectrum, the professional, scientific, and technical services industry was also a strong positive contributor to the acceleration in output growth. With a CAGR increase from 3.48 per cent (1997–2011) to 4.91 per cent (2011–2023), its percentage point difference was 1.43. Accounting for 8.37 per cent of total private business sector output in 2023, this industry's relative contribution to the change in growth of value-added output was 0.12 points (or 75.62 per cent)—a close second to construction.

Hours Worked

This section examines the changes in hours worked (as produced by the BLS) within the U.S. private business sector, offering insights into labour demand and employment trends (see Table 4).

[5] The manufacturing sector's share of output is a lot larger when using sectoral output (20.75 per cent) compared to value-added output (13.84 per cent). This is because manufacturing is extremely input intensive-intensive, with all of these inputs showing up in the final measure of output.

Table 4: Two-Digit NAICS Industries Hours Worked Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of hours worked in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(1.60)
Private Business Sector	-0.18	1.42	1.60	100.00	1.60	100.0
Agriculture, forestry, fishing, and hunting	-1.79	0.46	2.25	2.66	0.06	3.7
Mining	1.82	-1.66	-3.48	0.97	-0.03	-2.1
Utilities	-0.79	0.29	1.08	0.59	0.01	0.4
Construction	-0.61	2.76	3.37	7.20	0.24	15.2
Manufacturing sector	**-2.84**	**0.63**	**3.47**	**12.73**	**0.44**	**27.7**
Wholesale trade	-0.44	0.59	1.03	5.92	0.06	3.8
Retail trade	-0.40	-0.12	0.28	13.30	0.04	2.3
Transportation and warehousing	-0.13	3.46	3.59	4.87	0.17	11.0
Information	-1.03	0.80	1.83	2.66	0.05	3.1
Finance and insurance	0.43	1.02	0.59	5.97	0.04	2.2
Real estate and rental and leasing	-0.06	2.20	2.26	2.15	0.05	3.0
Professional, scientific, and technical services	1.48	2.24	0.77	8.43	0.06	4.0
Management of companies and enterprises	1.03	2.08	1.05	1.98	0.02	1.3
Administrative and waste management services	0.65	1.65	1.01	7.91	0.08	5.0
Educational services	8.13	1.22	-6.91	0.75	-0.05	-3.2
Health care and social assistance	2.55	2.15	-0.40	8.51	-0.03	-2.1
Arts, entertainment, and recreation	-0.12	1.92	2.04	1.25	0.03	1.6
Accommodation and food services	0.96	1.56	0.61	8.55	0.05	3.3
Other services, except government	-0.31	2.25	2.56	3.59	0.09	5.7

Source: U.S. Bureau of Labor Statistics (1) and (2)

For the total private business sector, the growth rate of hours worked has experienced a significant increase between the two observed periods. The CAGR for 1997–2011 was -0.18 per cent, which surged to 1.42 per cent for 2011–2023. This represents a positive percentage point difference of 1.60, signaling a notable expansion in hours worked.[6]

The manufacturing sector presents an intriguing case. Despite its sectoral output and value-added output experiencing a slowdown in their growth rates after 2011, growth in hours worked has increased. Between 1997-2011, the CAGR for manufacturing hours worked was -2.84 per cent. However, this figure rebounded to 0.63 per cent in the 2011–2023 period, representing a positive percentage point shift of 3.47. Manufacturing accounted for 12.73 per cent of total private business sector hours worked in 2011, only second to the retail trade sector. Additionally, its relative contribution to the increase in the growth rates of total private business sector hours worked was the highest of the two-digit NAICS sectors at 0.44 points (or 27.7 per cent).

Construction has also demonstrated a major rebound in growth rates of hours worked. From a negative CAGR of -0.61 per cent in 1997–2011, hours worked growth surged to 2.77 per cent in 2011–2023, marking a percentage point difference of 3.37. This aligns with trends observed in sectoral output and value-added output, where construction also showed significant contributions to overall growth in the post-2011 period. Construction accounted for 7.20 per cent of total hours worked in the private business sector in 2011. Its relative contribution to the increase in total private business sector hours worked stood at 0.24 points (or 15.2 per cent), trailing only behind manufacturing. This strong resurgence in construction hours was likely fueled by a mixture of rising infrastructure investments, housing demand, and commercial development.

Labour Productivity

In this section, we provide two estimates of labour productivity for the two-digit NAICS sectors; one is based on real sectoral output (as produced by the BLS) and other is based on real value-added output (as produced by the BEA).[7] Additionally, both measures use the same hours worked series (from the BLS). We refer to labour productivity calculated using real value-added output (from the BEA) as a CSLS calculation. We begin by first analyzing labour productivity estimates produced by BLS and then turn to labour productivity estimates produced by the CSLS.

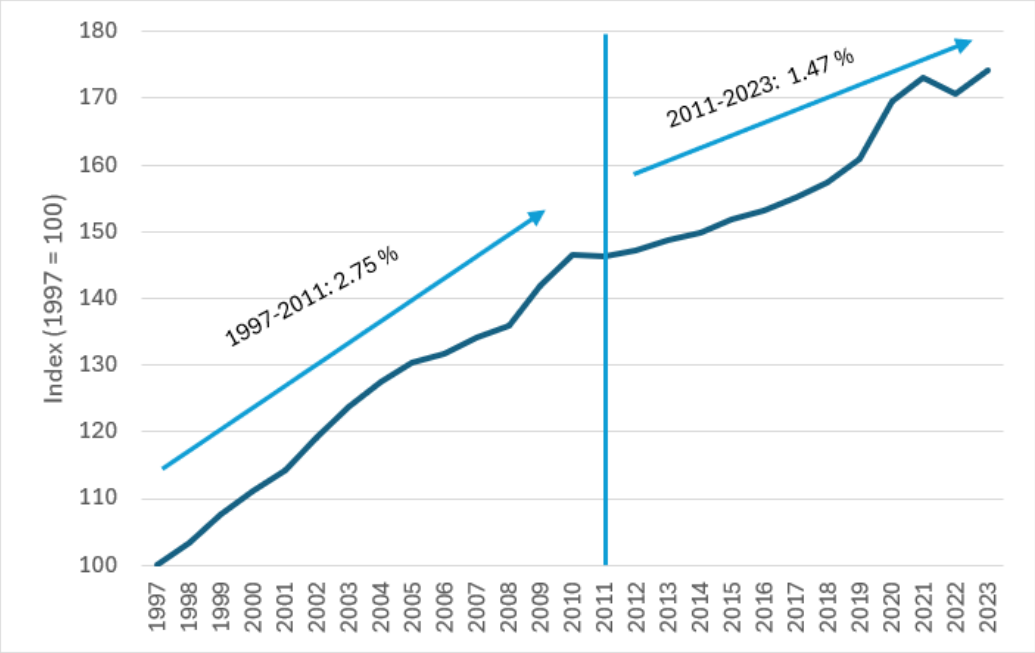
Labour Productivity – BLS (Data Based on Real Sectoral Output)

This section focuses on the contribution of various industries to the labour productivity slowdown in the U.S. private business sector (see Table 5). The estimates presented in this analysis are derived from BLS data, utilising real sectoral output for all two-digit NAICS industries while real value-added output is used for the private business sector.

[6] We focus on hours worked as it is the unit of labour input used to measure labour productivity as provided by the BLS.

[7] Note that this only applies where there is some level of disaggregation of the economy. Output for the total private business sector (as produced by both the BLS and BEA) are in value-added terms as all intermediate goods are "intrasectoral" at this level.

Chart 1: U.S. Private Business Sector Labour Productivity Index (2017 = 100)



Source: Bureau of Labor Statistics

Chart 1 shows that the overall private business sector experienced a notable decline in labour productivity growth, with its CAGR dropping from 2.75 per cent in 1997–2011 to 1.47 per cent in 2011–2023, resulting in a percentage point difference of -1.28 per cent. This deceleration signals a broader trend of slowing efficiency and output per hour worked across the sector.

The manufacturing sector stands out as it had by far the largest percentage point fall in labour productivity growth between the two periods and the second-largest contraction in the latter period. Its CAGR fell sharply from 3.75 per cent in 1997–2011 to -0.51 per cent in 2011–2023, resulting in a percentage point difference of -4.27 per cent. With a significant share of 12.73 per cent in total hours worked within the private business sector in 2011, manufacturing's relative contribution to the overall labour productivity growth slowdown is calculated at -0.54 points (or 42.4 per cent). This is the highest among all two-digit NAICS industries, indicating that the sector has had the largest relative influence on the deceleration of labour productivity in the last decade. This labour productivity slowdown stems from the fact that acceleration in the growth of hours worked has eclipsed that of output in the latter period. This is a clear indication of diminishing returns in certain manufacturing industries.

The transportation and warehousing sector also played a notable role in the labour productivity slowdown, with a drop in its CAGR from 2.01 per cent (1997–2011) to -1.09 per cent (2011–2023), resulting in a percentage point difference of -3.10 per cent. The sector held a 4.87 per cent share in total hours worked in 2011, translating to a relative contribution of -0.15 points (or 11.8 per cent) to the overall decrease in the growth rates of labour productivity.

Table 5: Two-Digit NAICS Industries Labour Productivity (Real Sectoral Output/Hours Worked) Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of hours worked in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-1.26)
Private Business Sector	2.75	1.47	-1.28	100.00	-1.28	100.0
Agriculture, forestry, fishing, and hunting	2.47	-0.31	-2.78	2.66	-0.07	5.8
Mining	-1.01	5.98	6.99	0.97	0.07	-5.3
Utilities	0.49	0.11	-0.38	0.59	0.00	0.2
Construction	-0.56	-0.04	0.52	7.20	0.04	-2.9
Manufacturing sector	**3.75**	**-0.51**	**-4.27**	**12.73**	**-0.54**	**42.4**
Wholesale trade	4.05	1.65	-2.40	5.92	-0.14	11.1
Retail trade	2.31	3.68	1.37	13.30	0.18	-14.3
Transportation and warehousing	2.01	-1.09	-3.10	4.87	-0.15	11.8
Information	5.95	4.92	-1.02	2.66	-0.03	2.1
Finance and insurance	2.78	0.71	-2.07	5.97	-0.12	9.6
Real estate and rental and leasing	2.53	1.45	-1.09	2.15	-0.02	1.8
Professional, scientific, and technical services	1.79	2.05	0.26	8.43	0.02	-1.7
Management of companies and enterprises	1.21	2.36	1.15	1.98	0.02	-1.8
Administrative and waste management services	2.33	2.08	-0.25	7.91	-0.02	1.5
Educational services	-2.10	-0.21	1.89	0.75	0.01	-1.1
Health care and social assistance	1.04	0.79	-0.24	8.51	-0.02	1.6
Arts, entertainment, and recreation	2.07	1.52	-0.56	1.25	-0.01	0.5
Accommodation and food services	1.02	1.13	0.12	8.55	0.01	-0.8
Other services, except government	0.97	0.45	-0.52	3.59	-0.02	1.4

Source: U.S. Bureau of Labor Statistics (1) and (2)

Notes:

- The private business sector labour productivity reported by the BLS uses real value-added output as sectoral output does not apply to the entire private business sector.

On the other hand, the retail trade industry showed a positive growth trajectory in labour productivity. From a CAGR of 2.31 per cent in 1997–2011, it rose to 3.68 per cent in 2011–2023, resulting in a positive percentage point difference of 1.37 per cent. With a 13.30 per cent share in total hours worked in 2011, its contribution to the labour productivity growth slowdown was 0.18 points (or -14.28 per cent). Thus, the retail trade industry was the largest offsetting force to the the overall private business sector slowdown in labour productivity.

Labour Productivity – CSLS (Estimates Based BEA Real Value-Added Output)

This section provides another perspective on productivity by using real value-added output per hour worked (as opposed to real sectoral output) to examine the slowdown in the growth of labour productivity (see Table 6). Labour productivity in this section is calculated by the CSLS using separate data on real value-added output from the BEA and hours worked from the BLS. The findings highlight key industries driving this trend, particularly manufacturing, which has played a dominant role in the deceleration of labour productivity growth.

The total private business sector experienced a substantial decline in labour productivity growth. From 1997 to 2011, the labour productivity CAGR was 2.70 per cent. However, this slowed dramatically to 1.22 per cent between 2011 and 2023, resulting in a percentage point difference of -1.48. This trend aligns with the BLS estimates on labour productivity, confirming a persistent deceleration in productivity growth over the last decade.[8]

Among all two-digit NAICS industries, manufacturing has had the most significant impact on the slowdown of labour productivity growth in the private business sector. The sector's labour productivity CAGR was 5.55 per cent from 1997 to 2011, but it plummeted to just 0.75 per cent in the 2011–2023 period. This represents a steep decline of -4.82 percentage points, the largest drop among all two-digit NAICS industries examined. The manufacturing growth rate in the latter period remained higher than nine other sectors, whereas the growth rate using the BLS labour productivity ranked second worst. Moreover, in contrast to sectoral output labour productivity, this measure remained positive.

This sector’s combination of sharp productivity decline and large employment base has resulted in an outsized impact on the overall slowdown, with the relative contribution to the deceleration of labour productivity growth being -0.61 points (or 41.3 per cent). This is the highest among all two-digit industries by a wide margin, confirming that manufacturing has been the single largest driver of the post-2011 labour productivity slowdown. The decline in manufacturing labour productivity aligns with broader sectoral output trends, which have shown stagnation.

While manufacturing’s slowdown in labour productivity growth stands out, the wholesale sector has also played a meaningful role. Its labour productivity CAGR fell from 3.02 per cent (1997–2011) to 0.24 per cent (2011–2023), resulting in a percentage point decline of 2.48.

[8] The labour productivity growth drop in the private business sector reported by the BLS was 1.28 points while that reported by the BEA was 1.48 points.

Table 6: Two-Digit NAICS Industries Labour Productivity (Real Value-Added Output/Hours Worked) Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of hours worked in 2011	Product 5=(4)(3)	Relatives in % 6=(5)/(-1.48)
Private Business Sector/Private Industries	2.70	1.22	-1.48	100.00	-1.48	100.0
Agriculture, forestry, fishing, and hunting	3.90	1.63	-2.27	2.66	-0.06	4.1
Mining	-0.42	5.89	6.31	0.97	0.06	-4.1
Utilities	2.22	0.78	-1.44	0.59	-0.01	0.6
Construction	-1.02	-0.76	0.26	7.20	0.02	-1.3
Manufacturing sector	**5.55**	**0.75**	**-4.80**	**12.73**	**-0.61**	**41.3**
Wholesale trade	3.02	0.54	-2.48	5.92	-0.15	9.9
Retail trade	2.46	3.09	0.63	13.30	0.08	-5.7
Transportation and warehousing	1.38	-0.92	-2.30	4.87	-0.11	7.6
Information	7.43	6.51	-0.92	2.66	-0.02	1.7
Finance and insurance	2.65	0.24	-2.41	5.97	-0.14	9.7
Real estate and rental and leasing	2.97	0.15	-2.82	2.15	-0.06	4.1
Professional, scientific, and technical services	1.97	2.61	0.64	8.43	0.05	-3.6
Management of companies and enterprises	-0.29	3.62	3.91	1.98	0.08	-5.2
Administrative and waste management services	2.82	1.51	-1.31	7.91	-0.10	7.0
Educational services	-4.73	-0.58	4.15	0.75	0.03	-2.1
Health care and social assistance	0.46	0.77	0.31	8.51	0.03	-1.8
Arts, entertainment, and recreation	2.03	0.46	-1.58	1.25	-0.02	1.3
Accommodation and food services	0.58	0.28	-0.30	8.55	-0.03	1.7
Other services, except government	-0.78	-1.68	-0.90	3.59	-0.03	2.2

Source: Bureau of Economic Analysis and Bureau of Labor Statistics

Notes:

- Dataset on real value added by industry (in billions of 2017 chained dollars) is sourced from BEA.
- The BEA uses the term 'Private Industries' to refer to all industries within the Private Business Sector.
- Datasets on hours worked (for both the total private business sector and 2-Digit NAICS industries) are sourced from the BLS.

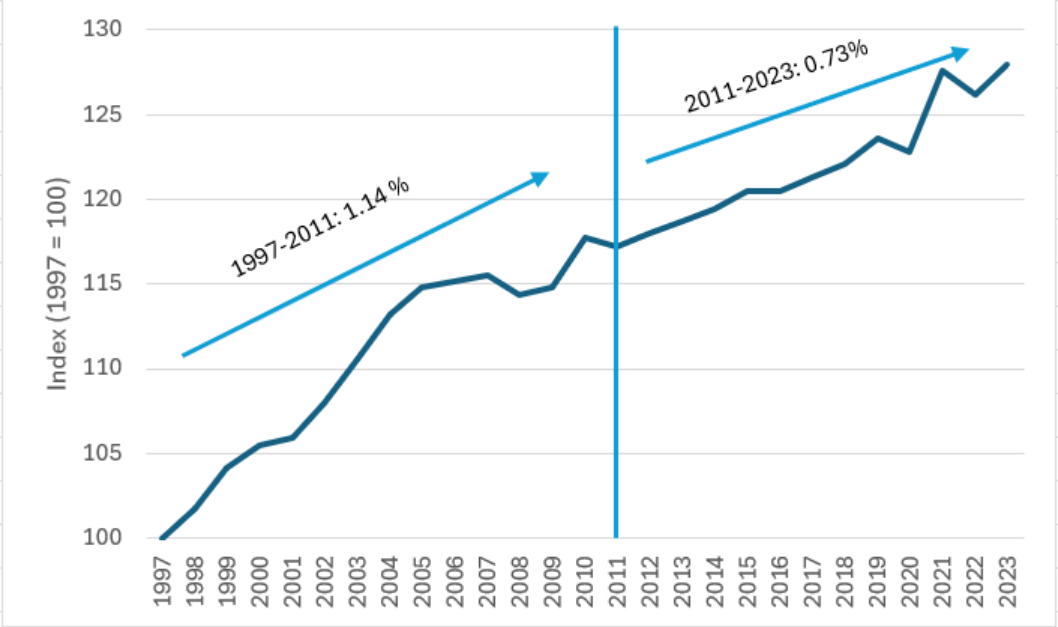
With a total hours worked share of 5.92 per cent in 2011, this translated to a relative contribution to the decline in labour productivity growth of -0.15 (or 9.9 per cent), making it the second-largest contributor to the labour productivity growth slowdown after manufacturing.

Total Factor Productivity

This section examines the decline in total factor productivity (TFP) growth within the U.S. private business sector from 2011 to 2023, compared to the preceding period of 1997 to 2011 (see Table 7).[9]

The total private business sector experienced a noticeable decline in TFP growth. From 1997 to 2011, the CAGR of TFP was 1.14 per cent. However, between 2011 and 2023, this growth rate slowed to 0.73 per cent, representing a percentage point decline of 0.41 (see Chart 2). This mirrors the trend observed in labour productivity, reinforcing concerns over the long-term productivity trajectory of the U.S. private business sector. However, it is worth noting that the decline in TFP growth after 2011 was considerably less than that of labour productivity (1.28 percentage points).

Chart 2: U.S. Private Business Sector Total Factor Productivity Index (2017 = 100)



Source: Bureau of Labor Statistics

Among all two-digit NAICS industries, manufacturing has had the most significant impact on the slowdown in TFP growth. From 1997 to 2011, the manufacturing sector's TFP CAGR was 1.38 per cent, but this plummeted to -0.35 per cent in the 2011–2023 period, reflecting a steep decline of -1.73 percentage points. Only five other industries had TFP growth worse than that of manufacturing in the 2011-2023 period.

[9] TFP data is sourced from the BLS and based on sectoral output.

Table 7: Two-Digit NAICS Industries Total Factor Productivity Growth in the U.S. Private Business Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current sectoral output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-0.41)
Private Business Sector	1.14	0.73	-0.41	100.00	-0.41	100.0
Agriculture, forestry, fishing, and hunting	1.30	0.60	-0.71	1.82	-0.01	3.1
Mining	0.22	3.58	3.37	2.23	0.07	-18.3
Utilities	0.30	0.10	-0.21	2.71	-0.01	1.4
Construction	-0.97	-0.36	0.61	5.37	0.03	-8.0
Manufacturing sector	**1.38**	**-0.35**	**-1.73**	**20.75**	**-0.36**	**87.5**
Wholesale trade	0.78	-0.39	-1.17	6.97	-0.08	19.8
Retail trade	0.79	1.08	0.29	6.15	0.02	-4.3
Transportation and warehousing	1.02	-0.31	-1.33	4.06	-0.05	13.2
Information	1.62	1.51	-0.11	5.85	-0.01	1.5
Finance and insurance	0.31	-0.80	-1.11	7.90	-0.09	21.5
Real estate and rental and leasing	-0.03	0.73	0.76	7.30	0.06	-13.5
Professional, scientific, and technical services	0.33	1.68	1.35	8.00	0.11	-26.4
Management of companies and enterprises	-0.70	2.33	3.03	2.35	0.07	-17.4
Administrative and waste management services	1.15	0.48	-0.67	3.53	-0.02	5.8
Educational services	-0.63	-0.72	-0.09	0.97	0.00	0.2
Health care and social assistance	0.15	0.40	0.26	7.47	0.02	-4.7
Arts, entertainment, and recreation	0.23	0.08	-0.15	1.01	0.00	0.4
Accommodation and food services	0.40	0.33	-0.07	3.28	0.00	0.6
Other services, except government	-0.76	-0.50	0.26	2.31	0.01	-1.5

Source: U.S. Bureau of Labor Statistics (1) and (2)

Notes:

- The percentage share of current sectoral output in 2011 is calculated by taking each sector's sectoral output as a share of the sum of sectoral output for all sectors. Sectors with more intersectoral linkage will see their share overestimated and vice versa.

Relative to the overall private business sector's TFP growth slowdown, manufacturing's contribution stands at -0.36 points (or 87.5 per cent)—the highest among all industries by a significant margin. This affirms that manufacturing has been the single largest driver of the post-2011 TFP growth rate decline.

The decline in manufacturing TFP growth is consistent with broader output trends, which shows a slowdown in sectoral output and value-added output growth as well. This trend is perhaps explained by the increase in hours worked within the manufacturing sector, suggesting that while employment levels have remained stable or even expanded, efficiency and technological advancement have not progressed at the same pace. This labour inefficiency has exacerbated the overall TFP growth slowdown, highlighting the manufacturing sector's central role in shaping productivity trends of the private business sector.

The wholesale trade industry has also played a meaningful role in the TFP slowdown. The sector's TFP CAGR declined from 0.78 per cent in 1997–2011 to -0.39 per cent in 2011–2023, resulting in a percentage point decline of -1.17. With a sectoral output share of 6.97 per cent in 2011, the industry's relative contribution to the overall private business sector's TFP growth slowdown stands at -0.08 points (or 19.8 per cent). This sector was the second-largest contributor to the slowdown after manufacturing.

In contrast, the professional, scientific, and technical services industry presents an interesting divergence. Unlike most industries, this sector experienced an improvement in TFP growth, with its CAGR rising from 0.33 per cent in 1997–2011 to 1.68 per cent in 2011–2023, reflecting a positive percentage point difference of 1.35. With a sectoral output share of 8.00 per cent in 2011, the relative contribution to the deceleration of TFP growth was 0.11 points (or -26.4 per cent)—the lowest among all two-digit NAICS industries. This finding indicates that the professional, scientific, and technical services industry was the largest offset to the slowdown in TFP growth.

Section III: Productivity Analysis of the United States Manufacturing Sector

In this section of the report, we focus exclusively on the U.S. manufacturing sector. As discussed in our analysis of the two-digit NAICS industries, the manufacturing sector has played a key role in driving overall productivity trends. In this section, we provide a more detailed examination of the sector by analyzing the manufacturing sector and its component industries at the three-digit NAICS level. This disaggregated approach allows for a deeper understanding of industry-specific dynamics, structural shifts, and productivity developments within manufacturing.

Our analysis is based on six tables created using datasets from the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA). We first analyze sectoral output produced by the BLS, followed by real value-added output produced by the BEA. We then look only into hours worked sourced by the BLS. Next, we examine labour productivity (defined as output per hour worked) using both BLS estimates, which are based on sectoral output, and CSLS estimates, which are based on real value-added output from the BEA. Finally, we assess BLS estimates of total factor productivity to gain deeper insights into the efficiency of input utilization across industries. All BLS measures in this section are real sectoral output as there is no analysis of the private business sector.

A key component of this section is the disaggregated analysis of three-digit NAICS industries within manufacturing, enabling a detailed examination of industry-specific contributions. By analyzing both labour productivity and total factor productivity at this level, we aim to provide a more precise assessment of productivity dynamics within the manufacturing sector, identify challenges faced by specific industries, and evaluate broader economic implications.

Output

Sectoral Output

The manufacturing sector experienced a slowdown in real sectoral output growth from 2011 to 2023 compared to the 1997–2011 period (see Table 8). The compound annual growth rate (CAGR) for total manufacturing declined from 0.81 per cent (1997–2011) to 0.12 per cent (2011–2023), marking a percentage point difference of -0.69. This decline in growth rate aligns with the broader trend observed in the private business sector, where manufacturing played a significant role in constraining overall output expansion. 11 out of 19 three-digit manufacturing industries experienced negative growth for sectoral output in the latter period, while 9 out of 19 industries saw a slowdown after 2011.

Among the three-digit NAICS manufacturing industries, computer and electronic products exhibited the largest relative contribution to this growth slowdown. The industry's real sectoral output CAGR plummeted from 5.19 per cent in 1997–2011 to -0.71 per cent in 2011–2023, resulting in a steep percentage point decline of -5.90.

Table 8: Three-Digit NAICS Industries Real Sectoral Output Growth in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current sectoral output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-0.69)
Total Manufacturing	0.81	0.12	-0.69	100.00	-0.69	100.0
Food and beverage and tobacco products	0.45	0.31	-0.14	14.32	-0.02	2.8
Textile mills and textile product mills	-4.58	-2.73	1.85	0.95	0.02	-2.5
Apparel and leather and allied products	-11.19	-1.84	9.35	0.32	0.03	-4.3
Wood products	-2.21	1.19	3.40	1.25	0.04	-6.1
Paper and paper products	-1.26	-1.59	-0.32	2.93	-0.01	1.4
Printing and related support activities	-2.03	-1.80	0.23	1.65	0.00	-0.5
Petroleum and coal products	0.82	0.41	-0.41	15.92	-0.06	9.3
Chemicals	0.52	0.06	-0.46	13.63	-0.06	9.0
Plastics and rubber products	-0.87	0.65	1.52	3.83	0.06	-8.4
Nonmetallic mineral products	-1.62	1.35	2.97	1.74	0.05	-7.4
Primary metal products	-0.66	-2.20	-1.54	4.57	-0.07	10.2
Fabricated metal products	-0.39	-0.15	0.24	6.13	0.01	-2.1
Machinery	0.31	-0.84	-1.15	6.97	-0.08	11.6
Computer and electronic products	**5.19**	**-0.71**	**-5.90**	**6.90**	**-0.41**	**58.7**
Electrical equipment, appliances, and components	-1.45	0.21	1.66	2.33	0.04	-5.6
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	0.35	2.65	2.30	7.73	0.18	-25.6
Other transportation equipment	1.33	-0.79	-2.11	4.72	-0.10	14.4
Furniture and related products	-2.25	-0.83	1.42	1.19	0.02	-2.4
Miscellaneous manufacturing	1.37	-0.45	-1.82	2.91	-0.05	7.6

Source: Bureau of Labor Statistics

Notes:

- The percentage share of current sectoral output in 2011 is calculated by taking each sector's sectoral output as a share of the sum of sectoral output for all sectors. Sectors with more intersectoral linkage will see their share overestimated and vice versa.

With a sectoral output share of 5.54 per cent in 2011, this industry had a relative contribution of -0.41 points (or 58.7 per cent) to the overall decline in manufacturing sectoral output growth. This underscores its outsized impact on the sector's stagnation.

The two industry groups that make up the transportation equipment industry also played a significant role, but each with contrasting contributions to the sectoral output slowdown.[10]

- Motor vehicles, bodies and trailers, and parts experienced a rebound, with its real sectoral output CAGR increasing from 0.35 per cent in 1997–2011 to 2.65 per cent in 2011–2023, reflecting a positive percentage point difference of 2.30. With a sectoral output share of 7.73 per cent, this sub-industry's relative contribution to the overall slowdown in manufacturing sectoral output growth stood at 0.18 points (or -25.6 per cent), the largest negative contribution among all three-digit NAICS manufacturing industries.

- Conversely, other transportation equipment saw a downturn, as its CAGR fell from 1.33 per cent in 1997–2011 to -0.79 per cent in 2011–2023, resulting in a percentage point decline of -2.11. With its sectoral output share of 4.72 per cent, it saw a relative contribution of -0.10 points (or 14.4 per cent) to the slowdown of sectoral output growth in manufacturing, marking the second-largest contribution to the growth decline after computer and electronic products.

These contrasting trends highlight the internal divergence within the broader transportation equipment industry, where automotive manufacturing has strengthened while other segments have struggled.

Another key industry contributing to the sector-wide sectoral output growth decline is machinery. The industry's real sectoral output CAGR declined from 0.31 per cent in 1997–2011 to -0.84 per cent in 2011–2023, reflecting a percentage point difference of -1.15. With its sectoral output share of 6.97 per cent, it had a relative contribution of -0.08 points (or 11.6 per cent) to the overall slowdown in total manufacturing sectoral output growth.

Value-Added Output

This section examines the real value-added output growth trends across three-digit NAICS industries within the manufacturing sector. The total manufacturing sector experienced a deceleration between the two time periods in real value-added output growth (see Table 9). The CAGR fell from 2.56 per cent in 1997–2011 to 1.39 per cent in 2011–2023, marking a percentage point decline of -1.17. This slowdown aligns the sectoral output trends and reinforces the notion that manufacturing output growth has been subdued in the past decade compared to the preceding period. This deceleration was not particularly widespread but rather concentrated in a few key industries. In the latter period, eight out of 19 three-digit manufacturing industries experienced negative growth while seven out of 19 saw a deceleration in growth between periods.

[10] Note that we refer to 19 two-digit NAICS industries when there are, in fact, only 18. This is because we split transportation equipment into two comprehensive parts: "motor vehicles, bodies and trailers, and parts" (NAICS 3361, 3362, and 3363) and "other transportation equipment" (NAICS 3364, 3365, 3366, and 3369).

Table 9: Three-Digit NAICS Industries Real Value-Added Output Growth in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current value-added output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-1.17)
Total Manufacturing	2.56	1.39	-1.17	100.00	-1.17	100.0
Food and beverage and tobacco products	0.16	1.31	1.16	11.26	0.13	-11.1
Textile mills and textile product mills	-4.10	-0.41	3.69	0.81	0.03	-2.5
Apparel and leather and allied products	-5.25	0.81	6.06	0.54	0.03	-2.8
Wood products	0.35	1.40	1.05	1.27	0.01	-1.1
Paper and paper products	-2.36	-0.26	2.10	2.89	0.06	-5.2
Printing and related support activities	0.57	-1.79	-2.36	2.08	-0.05	4.2
Petroleum and coal products	0.63	0.70	0.07	8.54	0.01	-0.5
Chemicals	1.47	1.65	0.18	16.42	0.03	-2.6
Plastics and rubber products	0.38	-0.44	-0.82	3.38	-0.03	2.4
Nonmetallic mineral products	-1.10	0.44	1.53	2.09	0.03	-2.7
Primary metal products	0.75	6.21	5.47	3.36	0.18	-15.7
Fabricated metal products	-0.77	-1.11	-0.33	6.84	-0.02	2.0
Machinery	1.66	-1.30	-2.96	7.78	-0.23	19.6
Computer and electronic products	**17.02**	**3.48**	**-13.54**	**12.20**	**-1.65**	**141.0**
Electrical equipment, appliances, and components	-0.78	-0.15	0.64	2.59	0.02	-1.4
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	2.57	3.88	1.31	5.61	0.07	-6.3
Other transportation equipment	2.44	1.68	-0.76	6.83	-0.05	4.5
Furniture and related products	-3.16	-0.53	2.63	1.18	0.03	-2.7
Miscellaneous manufacturing	3.07	1.65	-1.42	4.32	-0.06	5.2

Source: Bureau of Economic Analysis

Notes:

- Dataset on real value added by industry (in billions of 2017 chained dollars) is sourced from BEA

The computer and electronic products industry had the most substantial impact on the decline in real value-added output growth for total manufacturing. This industry exhibited an exceptionally high CAGR of 17.02 per cent from 1997–2011, but growth slowed dramatically to 3.48 per cent in the 2011–2023 period. The percentage point difference of -13.54 represents by far the most severe decline among all three-digit manufacturing industries. With a 12.20 per cent share of total manufacturing value-added output in 2011, this industry's relative contribution to the slowdown stands at -1.65 points (or 141.0 per cent). This was significantly higher than the industry's contribution to the slowdown using sectoral output; however, this difference is mainly the result in the discrepancy between sectoral output share and value-added output share.[11] Although most industries saw an acceleration in value-added growth between the periods, the total manufacturing sector still saw a decline of 1.17 points. The data suggests that decline concentrated in the computers and electronic products industry was the sole industry responsible for the decline observed.

The only other notable industry to play a role in manufacturing's decline was the machinery industry, although to a much lesser extent. Its CAGR fell from 1.66 per cent in 1997-2011 to -1.30 per cent in 2011–2023, leading to a percentage point decline of -2.96. With a 7.78 per cent share of total manufacturing value-added output in 2011, its relative contribution to the overall slowdown was -0.23 points (or 19.6 per cent).

In contrast, the primary metal products industry exhibited strong growth. Its real value-added output CAGR increased from 0.75 per cent in 1997–2011 to 6.21 per cent in 2011–2023, resulting in a percentage point increase of 5.47. With a modest 3.36 per cent share of total manufacturing value-added output in 2011, its relative contribution to the overall growth slowdown in manufacturing value-added output was 0.18 points (or -15.7 per cent). This industry had the largest negative contribution among three-digit NAICS manufacturing industries, offsetting part of the deceleration.

Hours Worked

This section examines changes in hours worked across three-digit NAICS manufacturing industries, providing insight into employment trends (see Table 10). For the total manufacturing sector, the CAGR in hours worked was -2.84 per cent from 1997–2011 but rebounded to 0.63 per cent from 2011–2023, marking a percentage point increase of 3.47. This suggests a notable resurgence in hours worked within manufacturing between the two time periods, aligning with broader private business sector patterns where the overall growth rate of hours worked accelerated as well. During the 2011-2023 period, 12 out of 19 three-digit manufacturing industries experienced growth in terms of hours worked, while all 19 industries experienced an acceleration after 2011.

Among three-digit NAICS industries, transportation equipment exhibited the largest contribution to the total acceleration in growth of hours worked.

[11] We are not sure why this is the case. One potential explanation is that the computer and electronic industry has more vertical integration in manufacturing, causing more inputs to be excluded in sectoral output numbers. The offshoring of input manufacturing could also be a potential explanation, but we are not aware of how BLS treats imported inputs.

Table 10: Three-Digit NAICS Industries Hours Worked Growth in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of total hours worked in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(3.47)
Total Manufacturing	-2.84	0.63	3.47	100.00	3.47	100.0
Food and beverage and tobacco products	-0.43	1.66	2.08	13.78	0.29	8.3
Textile mills and textile product mills	-7.01	-1.92	5.09	2.02	0.10	3.0
Apparel and leather and allied products	-9.04	-3.60	5.44	1.52	0.08	2.4
Wood products	-4.11	1.76	5.87	3.00	0.18	5.1
Paper and paper products	-3.46	-1.10	2.36	3.35	0.08	2.3
Printing and related support activities	-4.11	-1.88	2.23	3.78	0.08	2.4
Petroleum and coal products	-1.17	-0.37	0.80	1.00	0.01	0.2
Chemicals	-1.64	1.06	2.70	6.67	0.18	5.2
Plastics and rubber products	-2.68	1.14	3.82	5.40	0.21	5.9
Nonmetallic mineral products	-2.57	1.32	3.89	3.23	0.13	3.6
Primary metal products	-3.43	-0.61	2.81	3.51	0.10	2.8
Fabricated metal products	-1.71	0.33	2.04	11.56	0.24	6.8
Machinery	-2.43	0.20	2.63	9.19	0.24	7.0
Computer and electronic products	**-3.88**	**-0.41**	**3.48**	**9.10**	**0.32**	**9.1**
Electrical equipment, appliances, and components	-3.60	0.97	4.57	3.03	0.14	4.0
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	-3.89	3.09	6.98	6.20	0.43	12.5
Other transportation equipment	-1.35	0.76	2.10	5.77	0.12	3.5
Furniture and related products	-3.96	0.15	4.11	3.02	0.12	3.6
Miscellaneous manufacturing	-1.98	0.67	2.65	4.87	0.13	3.7

Source: U.S. Bureau of Labor Statistics

Motor vehicles, bodies and trailers, and parts saw an increase of 6.98 percentage points, from -3.89 per cent in 1997-2011 to 3.09 per cent in 2011-2023. This was the largest acceleration of any industry by far and contributed the most to the acceleration in hours worked at 0.43 points (or 12.5 per cent). Other transportation equipment followed a similar trend, but to a smaller extent, increasing 2.10 percentage points from a CAGR of -1.35 per cent to 0.76 per cent. It contributed 0.12 points (or 3.5 per cent) to the overall acceleration in hours worked.

The computer and electronic products industry also played a key role even though growth in hours worked remained negative in the second period. Hours worked improved from a -3.88 per cent CAGR in 1997–2011 to -0.41 per cent in 2011–2023, reflecting a percentage point shift of 3.48. With an 9.10 per cent share of total manufacturing hours worked, its relative contribution to the overall growth acceleration in hours worked was 0.32 points (or 9.1) per cent, the second highest among all three-digit industries in manufacturing.

Food, beverages, and tobacco products was another major industry, holding a 13.78 per cent share of total hours worked. With a CAGR percentage point difference of 2.08 between the periods 1997–2011 and 2011–2023, its relative contribution to the growth acceleration in hours worked was 0.29 points (or 8.28 per cent), reflecting the industry's steady expansion.

Labour Productivity

In this section, we provide two estimates of labour productivity for the three-digit NAICS manufacturing industries; one is based on real sectoral output (as produced by the BLS) and the other is based on real value-added output (as produced by the BEA). Additionally, both measures use the same hours worked series (from the BLS). We refer to labour productivity calculated using real value-added output (from the BEA) as a CSLS calculation. We begin by first analyzing labour productivity estimates produced by BLS and then turn to labour productivity estimates produced by the CSLS.

Labour Productivity – BLS (Data Based on Real Sectoral Output)

This analysis examines the slowdown in labour productivity growth within the U.S. manufacturing sector from 2011 to 2023, compared to the preceding period of 1997 to 2011 (see Table 11). The findings highlight key three-digit NAICS manufacturing industries driving this trend, with the most pronounced impact stemming from the computer and electronic products industry and the transportation equipment industry.

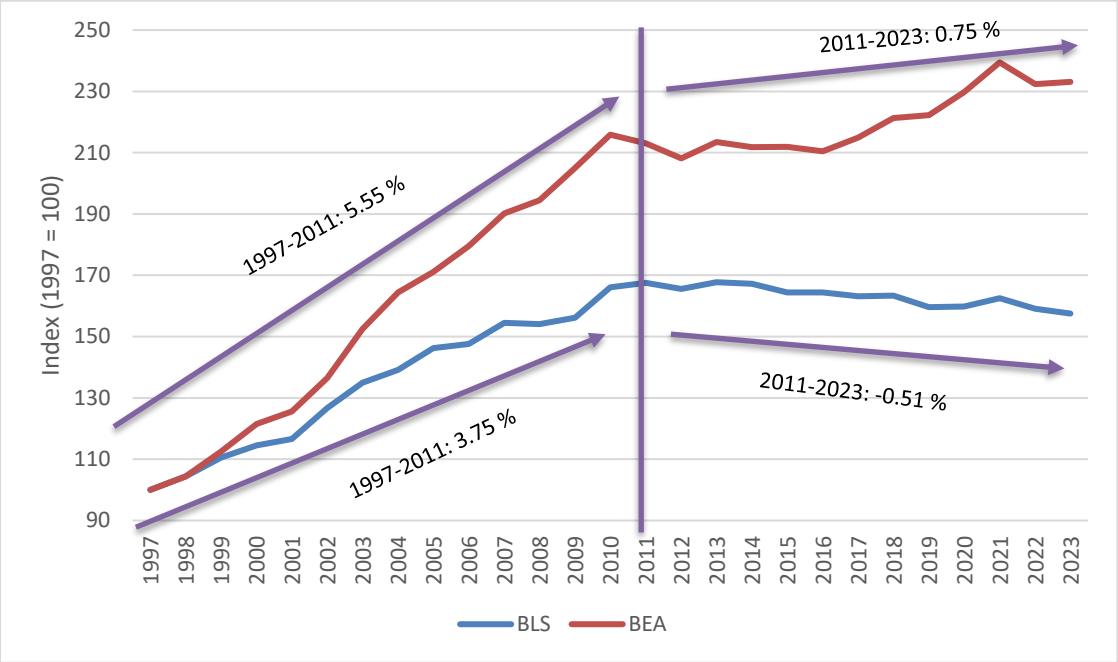
As seen in Chart 3, labour productivity across the total manufacturing sector experienced a significant decline between the two time periods. From 1997 to 2011, the sector’s productivity grew at a CAGR of 3.75 per cent. However, this reversed dramatically to a contraction of -0.51 per cent between 2011 and 2023, reflecting a percentage point difference of -4.27. This slowdown underscores a structural shift within the manufacturing sector, with this phenomenon being pervasive: 15 out of 19 three-digit manufacturing industries experienced negative labour productivity growth in the latter period, while 18 out of 19 industries saw a slowdown after 2011 (the apparel subsector being the only exception).

Table 11: Three-Digit NAICS Industries Labour Productivity Growth (Real Sectoral Output/Hours Worked) in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of total hours worked in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-4.27)
Total Manufacturing	3.75	-0.51	-4.27	100.00	-4.27	100.0
Food and beverage and tobacco products	0.88	-1.32	-2.20	13.78	-0.30	7.1
Textile mills and textile product mills	2.61	-0.82	-3.43	2.02	-0.07	1.6
Apparel and leather and allied products	-2.37	1.82	4.19	1.52	0.06	-1.5
Wood products	1.98	-0.56	-2.54	3.00	-0.08	1.8
Paper and paper products	2.28	-0.49	-2.77	3.35	-0.09	2.2
Printing and related support activities	2.17	0.08	-2.09	3.78	-0.08	1.9
Petroleum and coal products	2.01	0.78	-1.23	1.00	-0.01	0.3
Chemicals	2.19	-0.99	-3.18	6.67	-0.21	5.0
Plastics and rubber products	1.86	-0.48	-2.34	5.40	-0.13	3.0
Nonmetallic mineral products	0.97	0.03	-0.94	3.23	-0.03	0.7
Primary metal products	2.87	-1.59	-4.46	3.51	-0.16	3.7
Fabricated metal products	1.34	-0.48	-1.81	11.56	-0.21	4.9
Machinery	2.81	-1.04	-3.84	9.19	-0.35	8.3
Computer and electronic products	**9.44**	**-0.31**	**-9.74**	**9.10**	**-0.89**	**20.8**
Electrical equipment, appliances, and components	2.22	-0.75	-2.98	3.03	-0.09	2.1
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	4.40	-0.43	-4.84	6.20	-0.30	7.0
Other transportation equipment	2.71	-1.53	-4.24	5.77	-0.24	5.7
Furniture and related products	1.78	-0.98	-2.76	3.02	-0.08	2.0
Miscellaneous manufacturing	3.42	-1.11	-4.53	4.87	-0.22	5.2

Source: Bureau of Labor Statistics

Chart 3: U.S. Manufacturing Labour Productivity Index (1997 = 100) (BLS and BEA)



Source: Bureau of Economic Analysis and Bureau of Labor Statistics

Among these industries, the computer and electronic products industry exhibited the most severe decline in productivity growth. From a robust CAGR of 9.44 per cent in 1997–2011, productivity plummeted to -0.31 per cent in the 2011–2023 period, resulting in a staggering percentage point difference of -9.74. This decline represents the most substantial deterioration among all three-digit manufacturing industries. Additionally, with an 9.10 per cent share of total hours worked, the computer and electronic products industry's relative contribution to the overall growth slowdown in manufacturing labour productivity was -0.89 points (or 20.8) per cent, making it the largest contributor to the deceleration.

Transportation equipment manufacturing also played a crucial role in this slowdown. Labour productivity in motor vehicles, bodies and trailers, and parts declined from a CAGR of 4.40 to -0.43, marking a percentage point difference of -4.84. This decline, coupled with its employment base of 6.20 per cent of total hours worked industries, resulted in a relative contribution of -0.30 points (or 7.0 per cent) to the labour productivity growth slowdown. Other transportation equipment suffered a loss of -4.24 percentage points in hours worked growth, going from a CAGR of 2.71 to -1.53. Given its 5.77 per cent share of hours worked, other transportation equipment contributed -0.24 points (or 5.7 per cent) to the deceleration. Combining these two groups, we see that transportation equipment had the highest share of hours worked and the second-largest overall contribution to the deceleration.

Notably, the apparel, leather, and allied products industry was the only manufacturing subsector group to exhibit growth in labour productivity across the two periods. From a negative CAGR of -2.37 per cent in 1997–2011, productivity rebounded to 1.82 per cent in 2011–2023, yielding a positive percentage point difference of 4.19. However, its impact on the broader manufacturing

sector remained minimal since it represented just 1.52 per cent of total hours worked in 2011. As a result, its relative contribution to overall manufacturing's labour productivity growth slowdown stood at 0.06 points (or -1.49 per cent), indicating a rather negligible effect in offsetting the broader sector's productivity deceleration.

The findings confirm that nearly all (18 out of 19) three-digit manufacturing industries experienced a slowdown in productivity growth after 2011. While the computer and electronics industry did have a significant impact, the labour productivity slowdown was less driven by this industry compared to the output growth slowdown. In the case of output growth, computers and electronics played a pivotal role by exerting critical influence in driving the deceleration, as most industries did not experience a slowdown. In contrast, the widespread slowdown in labour productivity across nearly all industries suggests that the overall effect was more broadly shared.

Labour Productivity – CSLS (Estimates Based BEA Real Value-Added Output)

This section examines the slowdown in labour productivity growth (measured as real value-added output per hour worked) in the U.S. manufacturing sector from 2011 to 2023, compared to the preceding period of 1997 to 2011 (see Table 12). Labour productivity in this section is calculated by CSLS using separate data on real value-added output from the BEA and hours worked from the BLS. The findings highlight key industries driving this trend.

From 1997 to 2011, the CAGR in labour productivity was 5.55 per cent; however, this fell sharply to just 0.75 per cent between 2011 and 2023, resulting in a percentage point difference of -4.80 (see Chart 3). Furthermore, 17 out of 19 manufacturing industries experienced a slowdown between periods while only eight out of 19 saw negative growth after 2011. This trend aligns with prior BLS estimates on labour productivity, confirming a persistent deceleration in productivity growth over the last decade.

Among all three-digit NAICS industries in manufacturing, computers and electronic products had the most significant impact on the slowdown of labour productivity growth. Its CAGR was an incredible 21.74 per cent from 1997 to 2011 but plummeted to just 3.90 per cent in the 2011–2023 period, marking the largest drop among all three-digit industries in manufacturing, with a percentage point difference of -17.84.

This sector's share of total hours worked was 9.10 per cent, translating to a relative contribution of -1.62 points (or 33.8 per cent) to the overall growth slowdown in manufacturing labour productivity—the highest among all three-digit manufacturing industries. This finding highlights the continued outsized role of the computers and electronic products sector in shaping broader productivity trends within manufacturing.

Machinery recorded the third-largest percentage point difference in labour productivity growth between the two periods, trailing only computer and electronic products and transportation equipment. From 1997 to 2011, its CAGR was 4.19 per cent, but this declined sharply to -1.49 per cent in the 2011–2023 period, resulting in a percentage point difference of -5.68. With 9.19 per cent of total hours worked in 2011, the machinery industry's relative contribution to the labour productivity growth slowdown stood at -0.52 points (or 10.9 per cent).

Table 12: Three-Digit NAICS Industries Labour Productivity (Real Value-Added Output/Hours Worked) Growth in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of total hours worked in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-4.80)
Total Manufacturing	5.55	0.75	-4.80	100.00	-4.80	100.0
Food and beverage and tobacco products	0.59	-0.34	-0.93	13.78	-0.13	2.7
Textile mills and textile product mills	3.12	1.54	-1.58	2.02	-0.03	0.7
Apparel and leather and allied products	4.16	4.57	0.42	1.52	0.01	-0.1
Wood products	4.66	-0.35	-5.01	3.00	-0.15	3.1
Paper and paper products	1.14	0.85	-0.29	3.35	-0.01	0.2
Printing and related support activities	4.88	0.09	-4.79	3.78	-0.18	3.8
Petroleum and coal products	1.82	1.07	-0.75	1.00	-0.01	0.2
Chemicals	3.16	0.59	-2.57	6.67	-0.17	3.6
Plastics and rubber products	3.14	-1.56	-4.70	5.40	-0.25	5.3
Nonmetallic mineral products	1.51	-0.87	-2.38	3.23	-0.08	1.6
Primary metal products	4.32	6.87	2.55	3.51	0.09	-1.9
Fabricated metal products	0.95	-1.43	-2.38	11.56	-0.28	5.7
Machinery	4.19	-1.49	-5.68	9.19	-0.52	10.9
Computer and electronic products	**21.74**	**3.90**	**-17.84**	**9.10**	**-1.62**	**33.8**
Electrical equipment, appliances, and components	2.92	-1.11	-4.02	3.03	-0.12	2.5
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	6.72	0.76	-5.96	6.20	-0.37	7.7
Other transportation equipment	3.84	0.91	-2.92	5.77	-0.17	3.5
Furniture and related products	0.84	-0.68	-1.51	3.02	-0.05	1.0
Miscellaneous manufacturing	5.15	0.97	-4.18	4.87	-0.20	4.2

Source: Bureau of Economic Analysis and Bureau of Labor Statistics

Notes:

- Dataset on real value added by industry (in billions of 2017 chained dollars) is sourced from BEA.
- Dataset on hours worked is sourced from the BLS.
- This measure is calculated by the CSLS based on BEA real value-added output and BLS hours worked.

The transportation equipment industry also played a critical role in the productivity slowdown. Motor Vehicles, bodies and trailers, and parts fell 5.96 percentage points from a CAGR of 6.72 per cent in 1997-2011 to 0.76 in 2011-2023. Other transportation equipment fell 2.92 percentage points from a CAGR of 3.84 per cent to 0.91 per cent. These two groups of industries contributed -0.37 points (or 7.7 per cent) -0.17 points (or 3.5 per cent), respectively, to the slowdown. Thus, the overall transportation equipment industry was the third largest contributor to the value-added labour productivity slowdown.

It is important to note that certain results differ between labour productivity estimates based on sectoral output and those based on value-added output. For instance, between 2011 and 2023, labour productivity based on sectoral output was -0.51, while using value-added output it was 0.75, with one result being negative and the other positive. Furthermore, while 15 out of 19 three-digit manufacturing industries experienced negative growth in labour productivity between 2011 and 2023 when using sectoral output, only 8 out of 19 industries experienced negative growth when using value-added output.[12] However, both measures showed consistency in terms of a decline in growth rates between the two time periods. The percentage point difference was negative for both: -4.27 (sectoral output) and -4.80 (value-added output). Additionally, 18 out of 19 industries saw a slowdown in labour productivity after 2011 when using sectoral output, while 17 out of 19 industries experienced a slowdown after 2011 when using value-added output.

Total Factor Productivity

This section examines the post-2011 slowdown in total factor productivity (TFP) growth within the U.S. manufacturing sector by assessing industries at the three-digit NAICS level (see Table 13). This measure of TFP was produced by the BLS and is based on real sectoral output. The findings identify key industries contributing to the deceleration of TFP growth in manufacturing.

The manufacturing sector experienced a decline in TFP growth between the two time periods. From 1997 to 2011, the CAGR for TFP in manufacturing was 1.38 per cent. However, this dropped to -0.35 per cent between 2011 and 2023, resulting in a percentage point difference of -1.73 (see Chart 4) This downward trend in TFP growth mirrors previous findings on labour productivity slowdown, reinforcing the broader stagnation within U.S. manufacturing. 13 out of 19 three-digit manufacturing industries experienced negative growth in terms of TFP during the latter period, while 17 out of 19 industries saw a slowdown after 2011.

Among all three-digit NAICS industries, computers and electronic products had the most significant impact on the TFP growth slowdown yet again. This sector's TFP CAGR fell dramatically from 7.12 per cent in 1997–2011 to 0.70 per cent in 2011–2023, representing a percentage point decline of -6.41—the largest drop among all industries examined. With a sectoral output share of 5.90 per cent in 2011, the relative contribution of this industry to the total manufacturing TFP growth deceleration stands at -0.44 points (or 25.6 per cent), the highest among all three-digit NAICS manufacturing industries. The disproportionate role of computers and electronic products in the slowdown continues the trend observed in labour productivity, further underscoring the sector's outsized influence..

[12] Once again, this may be due to how BLS treats manufacturing inputs which come from overseas.

Table 13: Three-Digit NAICS Industries Total Factor Productivity Growth in the U.S. Manufacturing Sector, 1997-2011 and 2011-2023, and Contributions to Change between Periods

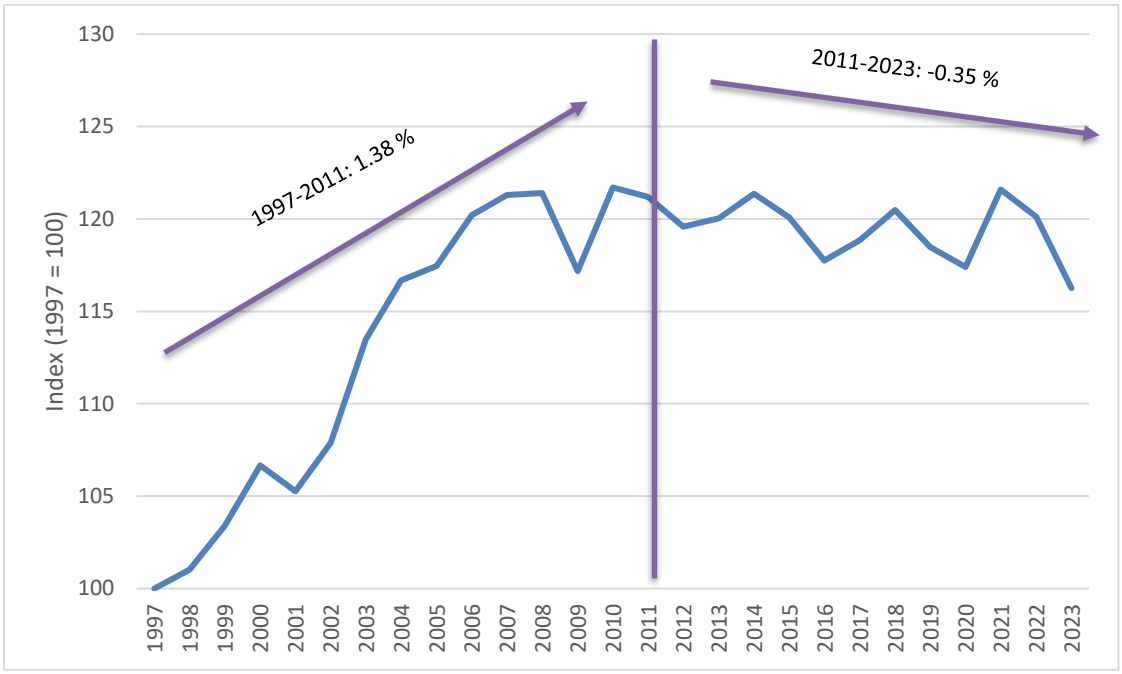
					Contributions to Change between Periods	
	1	2	3	4	5	6
Industry	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of current sectoral output in 2011	Absolute 5=(4)(3)	Relative in % 6=(5)/(-1.73)
Total Manufacturing	1.38	-0.35	-1.73	100.00	-1.73	100.0
Food and beverage and tobacco products	0.22	-0.33	-0.55	14.32	-0.08	4.6
Textile mills and textile product mills	0.54	0.22	-0.32	0.95	0.00	0.2
Apparel and leather and allied products	-0.50	2.09	2.59	0.32	0.01	-0.5
Wood products	1.01	-1.55	-2.56	1.25	-0.03	1.8
Paper and paper products	0.24	0.09	-0.15	2.93	0.00	0.2
Printing and related support activities	1.76	-0.17	-1.93	1.65	-0.03	1.8
Petroleum and coal products	0.13	0.81	0.68	15.92	0.11	-6.2
Chemicals	-0.09	-1.16	-1.07	13.63	-0.15	8.5
Plastics and rubber products	0.72	-0.62	-1.34	3.83	-0.05	3.0
Nonmetallic mineral products	-0.05	-0.09	-0.03	1.74	0.00	0.0
Primary metal products	0.91	-0.66	-1.57	4.57	-0.07	4.2
Fabricated metal products	0.01	-0.60	-0.61	6.13	-0.04	2.2
Machinery	0.97	-0.72	-1.69	6.97	-0.12	6.8
Computer and electronic products	**7.12**	**0.70**	**-6.41**	**6.90**	**-0.44**	**25.6**
Electrical equipment, appliances, and components	0.44	-0.49	-0.93	2.33	-0.02	1.3
Transportation Equipment						
Motor vehicles, bodies and trailers, and parts	1.05	0.65	-0.40	7.73	-0.03	1.8
Other transportation equipment	0.91	-0.82	-1.73	4.72	-0.08	4.7
Furniture and related products	-0.15	-0.81	-0.66	1.19	-0.01	0.5
Miscellaneous manufacturing	1.51	-0.21	-1.72	2.91	-0.05	2.9

Source: Bureau of Labor Statistics

Notes:

- The percentage share of current sectoral output in 2011 is calculated by taking each sector's sectoral output as a share of the sum of sectoral output for all sectors. Sectors with more intersectoral linkage will see their share overestimated and vice versa.
- TFP data is based on sectoral output.

Chart 4: U.S. Manufacturing Total Factor Productivity Index (2017 = 100) (BLS)



Source: Bureau of Labor Statistics

Another industry that played a meaningful role in the slowdown is chemicals. Its TFP CAGR declined from -0.09 per cent in 1997–2011 to -1.16 per cent in 2011–2023, resulting in a percentage point difference of -1.07. Despite a smaller percentage point decline compared to computers and electronic products, the chemicals industry had the second-largest sectoral output share among all three-digit NAICS manufacturing industries, at 13.63 per cent in 2011. Consequently, its relative contribution to the manufacturing TFP growth slowdown was -0.15 points (or 8.5 per cent), making it the second-largest contributor after computers and electronic products. Machinery was another notable sector. Its TFP CAGR dropped from 0.97 per cent in 1997–2011 to -0.72 per cent in 2011–2023, a percentage point difference of -1.69.

With a sectoral output share of 6.97 per cent in 2011, machinery's relative contribution to the overall TFP growth slowdown stood at -0.12 points (or 6.82 per cent), ranking third after computers and chemicals among all three-digit manufacturing industries.

Summary Tables:

Table 14: Number of Three-Digit Manufacturing Industries that Experienced Negative Growth in 2011-2023 and Slowdowns after 2011

Panel A: Hours Worked

	2011-2023	Change between Periods
Total manufacturing (CAGR)	0.63	3.47
Number of industries with negative growth (out of three-digit manufacturing industries)	7 / 19	-
Number of industries with post-2011 slowdown (out of three-digit manufacturing industries)	-	0 / 19
Contribution of computer and electronic products	-	9.1%

Source: Table 10

Panel B: Output

	2011-2023		Change Between Periods	
	Sectoral	Value-Added	Sectoral	Value-Added
Total manufacturing (CAGR)	0.12	1.39	-0.69	-1.17
Number of industries with negative growth (out of three-digit manufacturing industries)	11 / 19	8 / 19	-	-
Number of industries with post-2011 slowdown (out of three-digit manufacturing industries)	-	-	9 / 19	7 / 19
Contribution of computer and electronic products	-	-	58.7%	141.0%

Source: Tables 8 and 9

Panel C: Labour Productivity

	2011-2023		Change Between Periods	
	Sectoral	Value-Added	Sectoral	Value-Added
Total manufacturing (CAGR)	-0.51	0.75	-4.27	-4.8
Number of industries with negative growth (out of three-digit manufacturing industries)	15 / 19	8 / 19	-	-
Number of industries with post-2011 slowdown (out of three-digit manufacturing industries)	-	-	18 / 19	17 / 19
Contribution of computer and electronic products	-	-	20.8%	33.8%

Source: Tables 11 and 12

Panel D: Total Factor Productivity

	2011-2023	Change between Periods
Total manufacturing (CAGR)	-0.35	-1.73
Number of industries with negative growth (out of three-digit manufacturing industries)	13/ 19	-
Number of industries with post-2011 slowdown (out of three-digit manufacturing industries)	-	17 / 19
Contribution of computer and electronic products	-	25.6%

Source: Tables 13

Table 15: Summary of Key Findings in the U.S. Private Business Sector and Manufacturing

	1997-2011 CAGR (%)	2011-2023 CAGR (%)	Percentage Point Difference Between Periods	Contribution to Change Between Periods: Absolute	Contribution to Change Between Periods: Relative %
Private Business Sector					
Total Private Business Sector					
Labour Productivity (BLS)	2.75	1.47	-1.28	-	-
Labout Productivity (BEA)	2.70	1.22	-1.48	-	-
Total Factor Productivity	1.14	0.73	-0.41	-	-
Manufacturing					
Labour Productivity (BLS)	3.75	-0.51	-4.26	-0.54	42.4
Labout Productivity (BEA)	5.55	0.75	-4.80	-0.61	41.3
Total Factor Productivity	1.38	-0.35	-1.73	-0.36	87.5
Manufacturing Sector					
Computers and Electronics					
Labour Productivity (BLS)	9.44	-0.31	-9.75	-0.89	20.8
Labout Productivity (BEA)	21.74	3.90	-17.84	-1.62	33.8
Total Factor Productivity	7.12	0.70	-6.42	-0.44	25.6

Source: Tables 5, 6, 7, 11, 12, and 13

Section IV: Growth Accounting

Growth accounting offers a systematic framework for analysing the drivers of labour productivity growth by decomposing it into measurable contributions from factor inputs and technological progress. This section applies the framework to assess the sources of productivity growth in both the total private business sector and specifically manufacturing in the U.S., alongside manufacturing industries that have played a significant role in the sector-wide slowdown. For the private business sector, labour productivity growth is decomposed into contributions from labour composition, capital intensity, and TFP. In the case of manufacturing and its sub-industries, an additional factor, intermediate inputs intensity, is introduced to account for the role of materials, services, and energy. The following results are based on the BLS's growth accounting framework. As a reminder, the BLS uses value-added output in its calculation of labour productivity and TFP for the private business sector, whereas it uses real sectoral output in its calculation for the manufacturing sector and industries.

The tables presented in this section report growth accounting estimates for the private business sector, total manufacturing, and for key manufacturing industries that have had the greatest relative contribution to the manufacturing labour productivity growth slowdown. The two main industries examined are the computer and electronic products industry and transportation equipment industry. The latter is further disaggregated into motor vehicles, bodies and trailers, and parts, as well as other transportation equipment. These industries are selected for their substantial influence on the overall productivity decline in manufacturing.

The overall labour productivity results calculated in the growth accounting tables below (which are sums of the contributions and TFP) are consistent with the labour productivity values and trends discussed in earlier sections, with minor variations likely attributable to data revisions or differences between sectoral and value-added output measures. For a complete set of growth accounting results covering all manufacturing industries, as well as detailed factor contributions to value-added output growth (capital, labour, and TFP) in the private business sector, please refer to the data in the Appendix.

Total Private Business Sector

Labour productivity growth in the private business sector declined from a CAGR of 2.73 per cent during 1997–2011 to 1.45 per cent during 2011–2023, marking a reduction of 1.28 percentage points (see Table 16). The decomposition reveals that the primary driver of this decline was the reduced growth in the contribution of capital intensity, which fell by 0.80 percentage points between the two periods, accounting for 62.70 per cent of the labour productivity growth slowdown. Within capital intensity, the contributions of information processing equipment (IPE) and capital input excluding intellectual property products (IPP) and IPE experienced significant declines, dropping by 0.28 and 0.50 percentage points, respectively. The contribution of labour composition also decreased, albeit modestly, by 0.06 percentage points and accounting for 4.40 per cent of the labour productivity growth slowdown. TFP growth slowed by 0.42 percentage points between the two time periods, contributing 32.90 per cent to the overall productivity decline.

Table 16: Growth Accounting for Labour Productivity, Private Business Sector, 1997-2011 and 2011-2023

	1	2	3	4
	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of Contribution to Productivity Decline 4=(3)/(-1.28)
Labour Productivity	2.73	1.45	-1.28	100
Contribution of labour composition to labour productivity	**0.31**	**0.25**	**-0.06**	**4.40**
Contribution of capital intensity to labour productivity	**1.28**	**0.48**	**-0.80**	**62.70**
Contribution of information processing equipment (IPE) intensity to labour productivity	0.43	0.15	-0.28	21.88
Contribution of research and development (R&D) intensity to labour productivity	0.14	0.13	-0.02	1.19
Contribution of intellectual property products (IPP) excluding R&D intensity to labour productivity	0.24	0.24	0.00	-0.25
Contribution of capital input excluding IPP and IPE intensity to labour productivity	0.46	-0.04	-0.50	39.50
Total Factor Producticvity	**1.14**	**0.72**	**-0.42**	**32.90**

Source: Bureau of Labor Statistics

Note:

- Labour productivity growth is decomposed as the sum of the bolded contributions (labour composition, capital intensity) as well as TFP.

Notably, the contribution of research and development (R&D) intensity remained relatively stable, with only a marginal decline of 0.02 percentage points and a share of contribution to the private business sector labour productivity growth slowdown being only 1.19 per cent.

Total Manufacturing and Manufacturing Industries

Total Manufacturing Sector

As shown by Table 17, the manufacturing sector experienced a more pronounced productivity slowdown, with labour productivity growth declining from 3.71 per cent during 1997–2011 to -0.51 per cent during 2011–2023, a reduction of 4.22 percentage points. The largest contributor to this decline was the sharp reduction in TFP, which fell by 1.73 percentage points and accounted for 41.0 per cent of the total slowdown. The contribution of intermediate inputs intensity was also significant, which fell by 1.60 percentage points and accounted for 38.0 per cent of the total slowdown. Within intermediate inputs, materials intensity contributed the most, with a decline of 1.21 percentage points. The contribution of capital intensity also decreased significantly, falling by 0.78 percentage points (18.5 per cent of the total manufacturing labour productivity growth slowdown). Labour composition played a comparatively minor role, with its contribution decreasing by 0.11 percentage points (2.50 per cent of the total decline).

The labour productivity slowdown in the manufacturing sector was substantially more severe than in the overall private business sector, with a decline of 4.22 percentage points compared to just 1.28 percentage points in the latter. Interestingly, both sectors experienced nearly identical decreases in capital intensity, with 0.78 percentage points in manufacturing and 0.80 percentage points in the private business sector. However, the relative contribution of capital intensity to the overall slowdown varied significantly. In the private business sector, the decline in capital intensity accounted for approximately 62.7 per cent of the productivity slowdown, whereas in manufacturing, its share of contribution was only 18.5 per cent. This discrepancy stems from the much larger overall decline in manufacturing productivity (over three times that of the private sector), rendering capital intensity a smaller share of the labour productivity growth slowdown.

A similar pattern emerges when looking at TFP. In relative terms, TFP contributed comparably to the slowdown, with a share of contribution of 41.0 per cent in manufacturing and 32.9 per cent in the private sector. Yet in absolute terms, the difference was stark: manufacturing experienced a 1.73 percentage point drop in TFP growth, while the private sector saw a much smaller decline of 0.42 percentage points. This suggests that, although capital intensity fell at similar rates in both sectors in terms of the percentage points, there was a much larger decline in TFP that was a primary factor of the labour productivity growth slowdown in manufacturing.

Manufacturing Industries: Computer and Electronics Products

We examine the computer and electronic products industry because it was the most significant contributor to the overall manufacturing labour productivity growth slowdown, accounting for approximately 21 per cent of the total decline in labour productivity growth (calculated using sectoral output estimates from the BLS), and nearly 34 per cent (based on gross value-added output estimates), as discussed in Section III.

Table 17: Growth Accounting for Labour Productivity in U.S. Manufacturing, 1997-2011 and 2011-2023

	1	2	3	4
	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of Contribution to Productivity Decline 4=(3)/(-4.22)
Labour Productivity (Sum of Contributions and TFP)	3.71	-0.51	-4.22	100
Contribution of labour composition to labour productivity	**0.21**	**0.11**	**-0.11**	**2.50**
Contribution of capital intensity to labour productivity	**1.14**	**0.36**	**-0.78**	**18.52**
Contribution of information processing equipment (IPE) intensity to labour productivity	0.11	0.02	-0.09	2.08
Contribution of intellectual property products (IPP) excluding R&D intensity to labour productivity	0.06	0.01	-0.05	1.27
Contribution of capital input excluding IPP and IPE intensity to labour productivity	0.54	0.08	-0.45	10.68
Contribution of research and development (R&D) intensity to labour productivity	0.43	0.25	-0.18	4.30
Contribution of intermediate inputs intensity to labour productivity	**0.97**	**-0.63**	**-1.60**	**37.98**
Contribution of energy intensity to labour productivity	0.03	-0.08	-0.12	2.73
Contribution of materials intensity to labour productivity	0.77	-0.44	-1.21	28.71
Contribution of services intensity to labour productivity	0.17	-0.10	-0.27	6.51
Total Factor Productivity	**1.38**	**-0.35**	**-1.73**	**41.00**

Source: Bureau of Labor Statistics

NOTES:

- BLS uses real sectoral output in its calculation of labour productivity and total factor productivity for the manufacturing sector and manufacturing industries.
- Labour productivity growth is decomposed as the sum of the bolded input contributions (labour composition, capital intensity, intermediate inputs intensity, and TFP).

According to Table 18, the computer and electronic products industry exhibited the most dramatic productivity slowdown, with growth rates plummeting from 9.27 per cent during 1997–2011 to -0.31 per cent during 2011–2023, a decline of 9.58 percentage points. TFP was the dominant factor, contributing 67.1 per cent to the slowdown, as its growth rate fell by 6.42 percentage points. Intermediate inputs intensity also played a significant role with its contribution declining by 1.76 percentage points, accounting for 18.4 per cent of the total slowdown. Within intermediate inputs, services intensity experienced the largest reduction, falling by 0.94 percentage points which accounted for 9.9 per cent of the productivity slowdown; materials intensity was close behind, accounting for 8.66 per cent of the slowdown. The contribution of capital intensity declined by 1.06 percentage points (11.0 per cent of the total slowdown), with IPP excluding R&D intensity and capital input excluding IPP and IPE intensity both contributing the bulk of this reduction. Labour composition contributed comparatively modestly as observed in the trend for total manufacturing, with a decline of 0.34 percentage points, making up 3.5 per cent of the total slowdown.

Transportation Equipment

We examine the transportation equipment industry because it had the second-highest relative contribution to the manufacturing labour productivity growth slowdown, accounting for approximately 12.8 per cent (based on sectoral output estimates from the BLS), and around 11.2 per cent (based on gross value-added output estimates).[13] Due to limitations in TFP data availability from the BLS, we examine the transportation equipment industry by dividing it into two sub-industries: motor vehicles, bodies and trailers, and parts; and other transportation equipment.

1) Motor Vehicles, Bodies and Trailers, and Parts

As showcased in Table 19, labour productivity growth in this transportation equipment sub-industry declined from 4.35 per cent CAGR during 1997–2011 to -0.43 per cent during 2011–2023, a reduction of 4.77 percentage points. The most significant factor was the decline in intermediate inputs intensity, which fell by 3.77 percentage points and accounted for 79.0 per cent of the total slowdown. Materials intensity alone contributed 3.56 percentage points to the decline in intermediate input intensity, accounting for 74.6 per cent of the total contribution to the decline. The contribution of capital intensity also decreased, falling by 0.51 percentage points (10.7 per cent of the total slowdown), driven largely by reductions in capital input excluding IPP and IPE intensity. TFP growth slowed by 0.40 percentage points, contributing 8.4 per cent to the productivity decline. Labour composition again played a comparatively negligible role, with its contribution declining by only 0.09 percentage points (2.0 per cent of the total slowdown).

2) Other Transportation Equipment

In other transportation equipment, labour productivity growth declined from 2.69 per cent during 1997–2011 to -1.54 per cent during 2011–2023, a reduction of 4.22 percentage points (see Table 20).

[13] Here we sum the relative percentage contribution to the change of both motor vehicles, bodies, and parts; and other transportation equipment.

Table 18: Growth Accounting for Labour Productivity, Computer and Electronic Products, 1997-2011 and 2011-2023

	1	2	3	4
	1997-2011 CAGR	**2011-2023 CAGR**	**Percentage Points Difference 3=2-1**	**% Share of Contribution to Productivity Decline 4=(3)/(-9.57)**
Labour Productivity	9.28	-0.29	-9.57	100
Contribution of labour composition to labour productivity	**0.42**	**0.08**	**-0.34**	**3.53**
Contribution of capital intensity to labour productivity	**1.48**	**0.43**	**-1.06**	**11.03**
Contribution of information processing equipment (IPE) intensity to labour productivity	0.20	0.07	-0.13	1.37
Contribution of intellectual property products (IPP) excluding R&D intensity to labour productivity	0.24	-0.25	-0.49	5.10
Contribution of capital input excluding IPP and IPE intensity to labour productivity	0.34	0.01	-0.33	3.46
Contribution of research and development (R&D) intensity to labour productivity	0.71	0.65	-0.06	0.58
Contribution of intermediate inputs intensity to labour productivity	**0.25**	**-1.50**	**-1.76**	**18.36**
Contribution of energy intensity to labour productivity	-0.05	-0.03	**0.02**	-0.16
Contribution of materials intensity to labour productivity	0.21	-0.62	-0.83	8.66
Contribution of services intensity to labour productivity	0.08	-0.86	-0.94	9.87
Total Factor Productivity	**7.12**	**0.70**	**-6.42**	**67.07**

Source: Bureau of Labor Statistics

NOTES:

- BLS uses real sectoral output in its calculation of labour productivity and total factor productivity for the manufacturing sector and manufacturing industries.
- Labour productivity growth is decomposed as the sum of the bolded input contributions (labour composition, capital intensity, and intermediate inputs intensity) as well as TFP.

Table 19: Growth Accounting for Labour Productivity, Motor Vehicles, Bodies and Trailers, and Parts (Sub-industry of Transportation Equipment), 1997-2011 and 2011-2023

	1	2	3	4
	1997-2011 CAGR	**2011-2023 CAGR**	**Percentage Points Difference 3=2-1**	**% Share of Contribution to Productivity Decline 4=(3)/(-4.78)**
Labour Productivity	**4.35**	**-0.43**	**-4.77**	**100**
Contribution of labour composition to labour productivity	**0.12**	**0.03**	**-0.09**	**1.98**
Contribution of capital intensity to labour productivity	**0.53**	**0.02**	**-0.51**	**10.69**
Contribution of information processing equipment (IPE) intensity to labour productivity	0.04	0.03	0.00	0.09
Contribution of intellectual property products (IPP) excluding R&D intensity to labour productivity	0.00	0.01	0.01	-0.16
Contribution of capital input excluding IPP and IPE intensity to labour productivity	0.36	-0.09	-0.45	9.49
Contribution of research and development (R&D) intensity to labour productivity	0.13	0.07	-0.06	1.23
Contribution of intermediate inputs intensity to labour productivity	**2.65**	**-1.13**	**-3.77**	**78.96**
Contribution of energy intensity to labour productivity	0.05	-0.05	-0.10	2.05
Contribution of materials intensity to labour productivity	2.47	-1.09	-3.56	74.58
Contribution of services intensity to labour productivity	0.12	0.01	-0.11	2.31
Total Factor Productivity	**1.05**	**0.65**	**-0.40**	**8.37**

Source: Bureau of Labor Statistics

NOTES:

- BLS uses real sectoral output in its calculation of labour productivity and total factor productivity for the manufacturing sector and manufacturing industries.
- Labour productivity growth is decomposed as the sum of the bolded input contributions (labour composition, capital intensity, and intermediate inputs intensity) as well as TFP.

The largest contributor to this decline was intermediate inputs intensity, which fell by 1.63 percentage points (38.5 per cent of the total slowdown). Within intermediate inputs, services intensity experienced the sharpest decline, dropping by 1.08 percentage points. TFP growth slowdown also contributed significantly, declining by 1.73 percentage points (41.0 per cent of the total slowdown). The contribution of capital intensity decreased by 0.69 percentage points (16.4 per cent of the total slowdown), with R&D intensity contributing the most to this reduction. Labour composition played a minor role with its contribution declining by 0.17 percentage points (4.0 per cent of the total slowdown).

Table 20: Growth Accounting for Labour Productivity, Other Transportation Equipment, 1997-2011 and 2011-2023

	1	2	3	4
	1997-2011 CAGR	2011-2023 CAGR	Percentage Points Difference 3=2-1	% Share of Contribution to Productivity Decline 4=(3)/(-4.23)
Labour Productivity	2.68	-1.55	-4.23	100
Contribution of labour composition to labour productivity	**0.22**	**0.05**	**-0.17**	**3.99**
Contribution of capital intensity to labour productivity	**0.53**	**-0.16**	**-0.69**	**16.36**
Contribution of information processing equipment (IPE) intensity to labour productivity	0.07	0.00	-0.07	1.71
Contribution of intellectual property products (IPP) excluding R&D intensity to labour productivity	0.07	-0.03	-0.10	2.30
Contribution of capital input excluding IPP and IPE intensity to labour productivity	0.13	0.03	-0.11	2.49
Contribution of research and development (R&D) intensity to labour productivity	0.25	-0.16	-0.41	9.74
Contribution of intermediate inputs intensity to labour productivity	**1.02**	**-0.60**	**-1.63**	**38.50**
Contribution of energy intensity to labour productivity	0.01	0.03	0.02	-0.37
Contribution of materials intensity to labour productivity	0.49	-0.07	-0.56	13.26
Contribution of services intensity to labour productivity	0.52	-0.56	-1.08	25.53
Total Factor Productivity	**0.90**	**-0.84**	**-1.74**	**41.15**

Source: Bureau of Labor Statistics

NOTES:

- BLS uses real sectoral output in its calculation of labour productivity and total factor productivity for the manufacturing sector and manufacturing industries.
- Labour productivity growth is decomposed as the sum of the bolded input contributions (labour composition, capital intensity, and intermediate inputs intensity) as well as TFP.

Section V: International Analysis

In this section, we benchmark U.S. manufacturing against advanced economies using three independent sources. Subsections proceed in order: (1) Conference Board estimates, (2) OECD results, and (3) EUKLEMS results; in each, we report the U.S. level, slowdown, rank, and percentage-point slowdown. We end by synthesizing common patterns across sources to gauge the relative severity of the U.S. slowdown and to motivate the explanatory analysis in the final section.

The Conference Board Data Labour Productivity Trends (1995-2018)

The Conference Board Data (shown in Table 21) reveals a broad-based slowdown in manufacturing labour productivity growth across economies between 1995-2011 and 2011-2018, with the U.S. experiencing one of the most severe deteriorations. While the U.S. posted a relatively strong CAGR of 5.15 per cent during 1995-2011—exceeding most European peers like Germany (2.70 per cent), France (3.54 per cent), and the UK (3.14 per cent)—its growth collapsed to just 0.31 per cent in 2011-2018, a 4.84 percentage point decline that was among the largest in the dataset. This precipitous drop was exceeded only by Ireland (-6.08 points) and the Czech Republic (-5.72 points). Manufacturing rivals like Germany (-1.52 points difference) and Japan (-0.41 points difference) demonstrated significantly greater resilience during this period of global economic rebalancing. More concerning for U.S. competitiveness is that every country, other than the U.K. and Mexico, saw greater manufacturing labour productivity growth during the 2011-2018 period.

The U.S. transitioned from being a second-quartile in terms of labour productivity growth (ranking 13th out of 35 countries in 1995-2011) to a bottom-quartile one (out of 33 others during 2011-2018), with its growth rate falling below almost 95 per cent of the nations in the table. This dramatic reversal contrasts sharply with economies like Austria and Denmark, which maintained productivity growth above the average of 1.99 per cent in the latter period. Central and Eastern European nations (Bulgaria 6.00 per cent, Czech Republic 7.23 per cent, Hungary 5.19 per cent) recorded some of the highest early-period growth rates as they integrated into global supply chains, but these saw growth moderate by 2-5 percentage points post-2011 as catch-up effects diminished.

The near-universal nature of the productivity slowdown, affecting 31 of 35 countries, suggests common global headwinds including slowing technological diffusion and post-financial-crisis investment weakness. However, the U.S. stands out for both the magnitude of its decline and its inability to maintain leadership among peer nations with similar economic structures. Its 2011-2018 growth (at 0.31 points) was particularly weak compared to manufacturing powerhouses like Germany (1.18 per cent) and Switzerland (2.71 per cent).

OECD Labour Productivity Trends (1997-2023)

The OECD's longer-term data through 2023 confirms and extends these concerning trends, with the U.S. manufacturing sector's relative performance deteriorating further into what now appears to be a sustained competitiveness crisis. It is important to note that the U.S. is not included in the OECD productivity data base.

Table 21: The Conference Board Manufacturing Labour Productivity Growth in OECD Countries (Real Value Added per Hour Worked)

Country	1995-2011 CGR	2011-2018 CGR	Percentage Points Difference
Ireland	7.46	1.38	-6.08
South Korea	8.45	2.70	-5.75
Czech Republic	7.23	1.51	-5.72
Estonia	8.51	2.82	-5.69
United States	**5.15**	**0.31**	**-4.84**
Slovak Republic	9.96	5.53	-4.43
Hungary	5.19	0.92	-4.27
Poland	6.27	2.16	-4.11
Slovenia	6.02	1.96	-4.07
Sweden	4.88	1.07	-3.81
Romania	6.71	3.03	-3.68
Taiwan	7.38	4.14	-3.25
United Kingdom	3.14	-0.03	-3.17
Latvia	5.33	2.26	-3.07
Finland	4.60	1.64	-2.96
Portugal	3.33	0.78	-2.55
Australia	2.87	0.38	-2.50
Bulgaria	6.00	3.59	-2.41
OECD Unweighted Average	4.36	1.99	-2.36
France	3.54	1.72	-1.82
Mexico	1.46	-0.27	-1.73
Germany	2.70	1.18	-1.52
Norway	2.72	1.22	-1.50
Belgium	2.90	1.64	-1.26
Netherlands	3.20	1.98	-1.22
Austria	3.27	2.29	-0.98
Denmark	3.02	2.52	-0.50
Japan	2.66	2.25	-0.41
Switzerland	3.10	2.71	-0.39
Lithuania	2.59	2.38	-0.21
Spain	1.84	1.79	-0.05
Canada	1.73	1.72	-0.02
Croatia	2.25	2.29	0.03
Singapore	4.63	4.73	0.10
Greece	1.30	1.83	0.54
Italy	1.07	1.60	0.54

Source: The Conference Board

For this analysis, the U.S. values used for comparison are those sourced from the BEA while the rest of the data in Table 22 is derived from the OECD, which may employ different data collection methodologies. According to the BEA data, the U.S. recorded a 5.55 per cent CAGR from 1997 to 2011, surpassing the OECD unweighted average of 4.02 per cent. However, its growth significantly declined to 0.75 per cent from 2011 to 2023, a 4.80 percentage point reduction that is more than double the OECD average drop of -2.09 percentage points. This places the U.S. among the worst performers of advanced economies. The U.S. only outperformed Australia, Canada, Finland, Norway, and Mexico in terms of its 2011-2023 CAGR and only outperformed Czechia, Slovakia, Lithuania, and Romania in terms of productivity falloff between the two periods.

Two particularly concerning patterns emerge from the extended dataset:

- First, the U.S. productivity growth collapse was significantly worse than key competitors; Germany (-1.35 points), Canada (-1.39 points), and the UK (-3.88 points) all experienced milder decelerations despite facing relatively similar global headwinds.

- Second, the U.S. did not just decline but fundamentally reversed its competitive position. Its 0.75 per cent 2011-2023 rate was below France (0.82 per cent) and crisis-prone economies like Italy (0.76 per cent) and Greece (0.80 per cent).

The data reveals only two meaningful exceptions to the global slowdown that highlight alternative trajectories in the period 2011-2023: Ireland maintained exceptional 7.18 per cent, while Denmark achieved productivity acceleration by going from a labour productivity growth rate of 2.98 per cent to 4.60 per cent in manufacturing. For most others, including the U.S., the post-2011 period marked not just slower growth but often outright stagnation; 20 of the 33 OECD countries in Table 22 recorded growth below 2 per cent CAGR, suggesting systemic barriers to productivity enhancement. The U.S. experience appears particularly acute given its earlier strong position. Its 4.80-point decline was 130 per cent larger than the OECD average drop, the growth rate fell to 14 per cent of its previous level, and the duration of underperformance now spanned a full business cycle.

EUKLEMS & INTANProd Labour Productivity Trends (1997-2021)

The EUKLEMS & INTANProd dataset from Luiss Lab of European Economics, covering the period from 1997 to 2021, broadly reinforces the analysis of labour productivity trends in manufacturing despite its slightly shorter time frame compared to the OECD dataset (see Table 23). While differences in methodology exist (for example, EUKLEMS uses chain-linked volumes based on national accounts, whereas the OECD relies on constant price series), these discrepancies are minor and do not obscure the overarching narrative. Both datasets point to a widespread deceleration in manufacturing labour productivity growth across advanced economies after 2011. There are, however, notable exceptions. Countries such as Cyprus, Denmark, Ireland, Italy, and Luxembourg managed to defy this broader trend, maintaining or accelerating their productivity growth during the post-2011 period.

According to EUKLEMS, 24 out of 29 countries experienced slower growth in manufacturing labour productivity in 2011-2021 relative to 1997–2011, mirroring overall findings in the previous datasets.

Table 22: OECD Manufacturing Labour Productivity (Gross value added per hour worked) CGR %, 2015 Constant Prices

Country	1997-2011 CGR	2011-2023 CGR	Percentage Points Difference
Romania	7.91	1.11	-6.81
Slovak Republic	10.74	4.56	-6.18
Lithuania	8.00	2.42	-5.58
Czechia	7.72	2.30	-5.42
United States (BEA)	**5.55**	**0.75**	**-4.80**
Poland	7.46	2.70	-4.77
Finland	4.65	0.28	-4.38
United States (BLS)	3.75	-0.51	-4.27
Hungary	4.97	0.87	-4.10
United Kingdom	5.47	1.59	-3.88
Slovenia	5.27	1.83	-3.44
Estonia	6.10*	2.94	-3.16
Sweden	4.64	1.58	-3.06
France	3.52	0.82	-2.69
Iceland	3.94	1.78	-2.17
Australia	1.62	-0.48*	-2.10
OECD Unweighted Average	4.02	1.93	-2.09
Norway	2.55	0.52	-2.02
Bulgaria	5.74	3.76	-1.98
Netherlands	3.67	1.73	-1.95
Austria	3.38	1.60	-1.79
Latvia	4.79	3.02	-1.77
Portugal	2.80	1.04	-1.76
Belgium	2.74	1.09	-1.65
Canada	1.87	0.48	-1.39
Germany	2.69	1.34	-1.35
Mexico	0.40*	-0.67	-1.07
Croatia	2.38	1.55	-0.83
Greece	1.35	0.80	-0.56
Israel	3.00	2.44*	-0.56
Costa Rica	2.56	2.06	-0.49
Spain	1.79	1.43	-0.36
Italy	1.02	0.76	-0.27
Ireland	7.40	7.18	-0.22
Denmark	2.98	4.60	1.61
Luxembourg	-0.06	3.48	3.54

Source: Organisation for Economic Co-operation and Development (OECD)

NOTE:

- Growth rates for the following countries were imputed: Australia (2011-2017 CGR), Estonia (2000-2011 CGR), Israel: (2011-2022 CGR), and Mexico (2005-2011 CGR).
- U.S. values are not from the OECD data set.
- The OECD unweighted average does not include the United States BEA or BLS values. It also does not include non-OECD countries including Bulgaria, Croatia, and Romania.

The sharpest slowdowns between the two periods occurred in Slovakia, Romania, Czechia, Poland, and Lithuania; these are all countries that had posted exceptionally high growth rates above 7.5 per cent in the earlier period, thereby amplifying the magnitude of their subsequent slowdowns. The U.S. also recorded a substantial slowdown of -4.34 percentage points, placing it among the worst performers (exceeded only by the five countries noted above) and well below the dataset average decline of -1.99 points. It is worth noting that the U.S.'s earlier growth rate of 5.38 per cent was more moderate compared to the aforementioned nations.

Importantly, the U.S' slowdown of 4.34 points (in Table 23) also aligns closely with the 4.80 point drop measured using BEA data and the 4.27 point drop using BLS data, further reinforcing the conclusion that the U.S. has undergone one of the most significant productivity slowdowns among advanced economies. Its post-2011 growth rate of 1.04 per cent lags key peers such as the UK, Denmark, Germany, and France.

Several countries display consistent trends across both datasets. Denmark maintained strong productivity performance, exhibiting consistent acceleration in both the OECD and EUKLEMS datasets. Luxembourg also recorded a substantial surge across both time periods, pointing to a robust recovery. However, there are some discrepancies that merit attention; Ireland, for instance, exhibited a relatively strong post-2011 growth in both the OECD and EUKLEMS datasets (7.18 per cent in OECD and 9.73 per cent in EUKLEMS), yet Table 22 reports a percentage point decline of -0.22 while Table 23 reports an increase of 2.33 points. Likewise, Italy showed modest improvement in EUKLEMS, in contrast to a slight decline of -0.27 in the OECD data. These differences may stem from variations in methodology, measurement periods, or revisions to national accounts.

Table 23: EUKLEMS & INTANProd Manufacturing Labour Productivity (Gross value added per hour worked) CGR %, 2020 Chain Linked Volumes NCU

Country	1997-2011 CGR	2011-2021 CGR	Percentage Points Difference
Slovakia	10.75	4.40	-6.34
Romania	7.91	1.72	-6.20
Czechia	7.72	1.85	-5.87
Poland	7.46	1.76	-5.70
Lithuania	7.87	3.42	-4.45
United States	**5.38**	**1.04**	**-4.34**
Hungary	4.96	1.05	-3.92
Bulgaria	5.74	1.95	-3.78
Finland	4.65	0.87	-3.78
Estonia	7.57	3.91	-3.65
Slovenia	5.27	2.54	-2.73
Sweden	4.64	1.95	-2.68
France	3.52	1.16	-2.36
United Kingdom	5.49	3.16	-2.33
Unweighted Average	4.44	2.45	-1.99
Austria	3.38	1.68	-1.70
Netherlands	3.67	2.06	-1.62
Germany	2.69	1.30	-1.39
Croatia	2.38	1.10	-1.28
Portugal	2.64	1.44	-1.20
Belgium	2.61	1.67	-0.94
Greece	1.35	0.64	-0.72
Japan	3.07	2.39	-0.68
Latvia	4.78	4.18	-0.60
Spain	1.79	1.35	-0.44
Italy	1.02	1.13	0.11
Denmark	2.98	4.02	1.04
Ireland	7.40	9.73	2.33
Cyprus	0.03	3.00	2.97
Luxembourg	-0.06	4.52	4.58

Source: EUKLEMS & INTANProd Release 2025, National Accounts

Section VI: Decomposition Analysis of the United States Manufacturing Sector Labour Productivity Growth

Overview of the CSLS Decomposition Framework

To identify the sources of productivity growth over a given period, the CSLS has developed a decomposition formula which breaks down aggregate productivity growth into within-sector effects and re-allocation (level and growth) effects. The decomposition can be expressed as follows:

$$\Delta P = \sum h_i^0 \, \Delta P_i + \sum (P_i^0 - P^0) \, \Delta h_i + \sum (\Delta P_i - \overline{\Delta P}) \Delta h_i$$

Where P is the overall business sector labour productivity level, Pi is the labour productivity level in sector i, hi is the share of total economy-wide labour hours which is employed in sector i, the subscript 0 indicates a variable in time 0 (the beginning of the period) as opposed to time 1 (the end of the period), Δ indicates change over the period, and ΔP is the average change in business sector productivity across sectors over the period.

The first term in the decomposition captures what we call within-sector effects. Within-sector effects refer to aggregate productivity growth attributable to productivity growth within sectors. The latter two terms, meanwhile, capture two distinct re-allocation effects. Re-allocation effects stem from changes in the share of labour input associated with a sector. All else equal, an increase in the share of total labour input which is employed by a sector with above-average productivity will increase the aggregate labour productivity growth in the economy. Conversely, an increase in the labour input share of a sector with below-average productivity will reduce aggregate labour productivity growth in the economy. These re-allocation effects can be further decomposed into the level effect and the growth effect: the second and third term in the decomposition equation, respectively. The level effect captures changes in the productivity level resulting from the movement of labour inputs across sectors with different productivity levels. Conversely, the growth effect captures changes which result from the movement across sectors which experience different degrees of productivity growth over the relevant period. [14]

BLS Labour Productivity Growth Decomposition

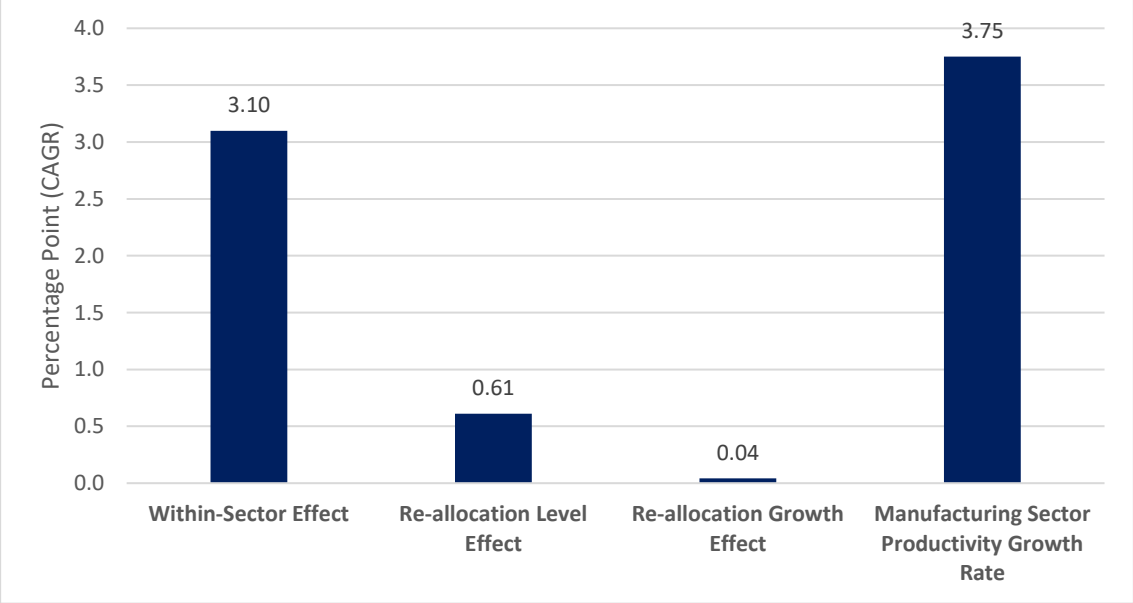
We begin by analyzing how each of the three separate decomposition effects (represented by the three summations in the CSLS decomposition formula) contributed separately to the overall labour productivity growth observed in the manufacturing sector. Chart 5 presents the percentage point contribution by each effect to the manufacturing labour productivity growth in both periods. Panel A reveals that the majority of the 3.75 per cent CAGR seen in manufacturing labour productivity in 1997-2011 stemmed from within-sector improvements (3.10 points) followed by much smaller contributions from the re-allocation level (0.61 points) and growth (0.04 points) effects. It's important to note that each of the three effects contributed positively to growth over this period,

[14] In addition to the decomposition tables presented in this section, additional tables used for the decomposition analysis are included in the Appendix.

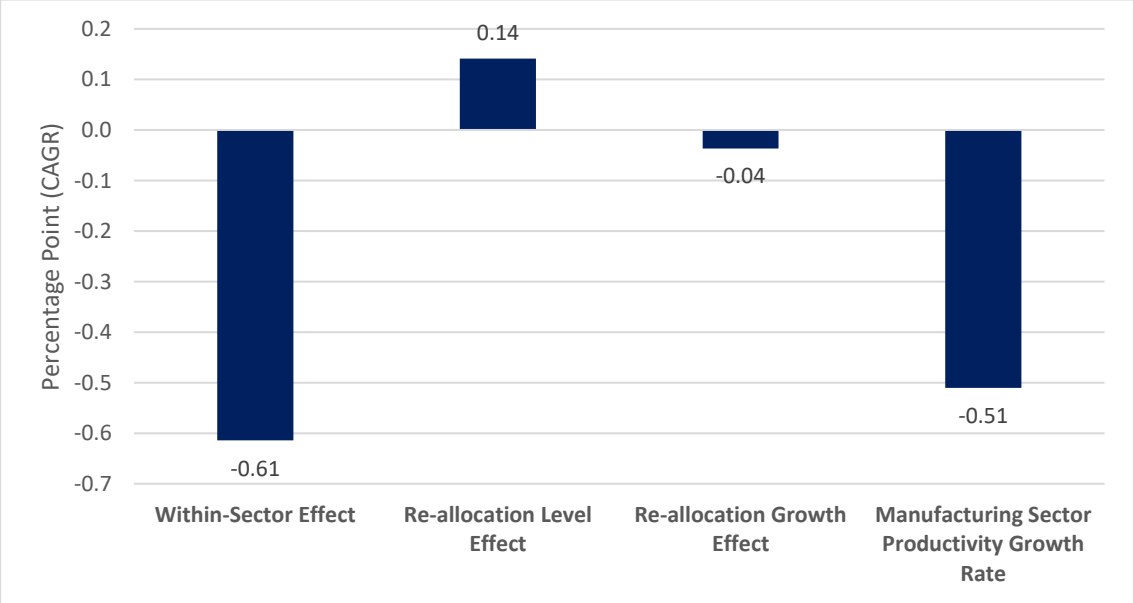
indicating that manufacturing industries themselves were getting more productive and that, on average, labour was shifting to more productive industries.

Chart 5: Absolute Percentage Point Contribution by Decomposition Effect to BLS Manufacturing Labour Productivity Growth

Panel A: Contributions to Manufacturing Growth over 1997-2011



Panel B: Contributions to Manufacturing Growth over 2011-2023



Source: CSLS

Things took a turn in the 2011-2023 period, as shown in panel B, with manufacturing labour productivity experiencing growth of -0.51 points. The within-sector effect was to blame, as its contribution turned negative (at -0.61 points) but was partially offset by improvements in the re-allocation of labour (netting 0.10 points between the level and growth effects). The story told by panel B is one of efficient labour reallocation in conjunction with deteriorating inter-industry productivity. The discrepancy between the level and growth effects indicates that, while labour (measured using hours worked) did shift to those industries which were initially more productive, those industries were also more likely to observe contractions in productivity. This is not surprising given how widespread the slowdown was in the manufacturing sector.

Similarly, Table 27 and Table 28 decompose each manufacturing industry's labour productivity growth for a deeper productivity analysis within each industry (as opposed to the economy-wide analysis provided by Chart 5). These tables also provide percentage point contributions by industry, allowing for deeper insight into industries responsible for the growth observed

In 1997-2011, the computer and electronic products industry had the largest contribution to the 3.75-growth rate, contributing a total of 0.65 points (or 17.3 per cent). During this period, this industry contributed a total of $11.8 per hour, stemming from its positive within-sector and level effects but offset slightly by its growth effect.[15] Its within-sector effect was the largest of any industry, indicating uniquely large productivity improvements. Interestingly, this industry initially saw labour shift away, culminating in two opposing effects. The level effect was still positive as this industry exhibited an initial lower-than-average productivity, so fleeting labour led to a positive contribution. The growth effect was negative as the industry exhibited larger-than-average labour productivity growth, so fleeting labour led to a negative contribution.

Now turning to the 2011-2023 period, computers and electronic products contributed a total of -0.02 points (or 4.5 per cent) to the overall manufacturing labour productivity growth of -0.51 per cent. During this period, this industry contributed a total of -$0.58 per hour, resulting from its negative within-sector effect caused by a productivity contraction. This industry's worse-than-average performance in productivity levels, in combination with a once again falling share of labour input, led to positive level effect.

[15] All dollar values referred to in this section are chained 2017 dollars.

Table 24: CSLS Sectoral Output Decomposition by Industry: Summary Results of Within-Sector, Re-allocation Level, and Re-allocation Growth Effects on Labour Productivity in the U.S. Manufacturing Sector, 1997–2011

	Within-Sector Effect		Re-allocation Level Effect		Re-allocation Growth Effect		Total Effect		
Industry	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Total Contribution to 3.75% CAGR (1997-2011)
Manufacturing	56.20	100.00	11.08	100.00	0.75	100.00	68.03	100.00	3.75
Food and beverage and tobacco products	2.53	4.50	4.11	37.07	-1.21	-162.61	5.42	7.97	0.30
Textile mills and textile product mills	1.14	2.03	0.42	3.81	0.44	58.69	2.00	2.94	0.11
Apparel and leather and allied products	-0.69	-1.23	0.74	6.66	1.71	229.36	1.76	2.59	0.10
Wood products	0.90	1.60	0.10	0.91	0.19	25.62	1.19	1.75	0.07
Paper products	1.88	3.34	-0.14	-1.23	0.02	2.08	1.76	2.58	0.10
Printing and related support activities	1.07	1.91	0.21	1.93	0.25	33.54	1.54	2.26	0.08
Petroleum and coal products	3.71	6.60	2.90	26.18	0.88	117.48	7.49	11.00	0.41
Chemical products	6.18	10.99	2.27	20.52	0.57	75.97	9.02	13.26	0.50
Plastics and rubber products	1.84	3.28	0.03	0.26	-0.03	-3.43	1.85	2.72	0.10
Nonmetallic mineral products	0.51	0.91	0.02	0.21	-0.05	-6.54	0.48	0.71	0.03
Primary metals	2.91	5.17	-0.19	-1.73	-0.06	-8.30	2.65	3.90	0.15
Fabricated metal products	1.89	3.37	-0.02	-0.16	-0.64	-85.40	1.24	1.82	0.07
Machinery	4.70	8.37	0.10	0.91	-0.01	-1.37	4.79	7.05	0.26
Computer and electronic products	**11.83**	**21.04**	**0.76**	**6.86**	**-0.82**	**-110.49**	**11.76**	**17.29**	**0.65**
Electrical equipment, appliances, and components	1.43	2.54	-0.08	-0.69	0.05	6.64	1.40	2.06	0.08
Motor vehicles, bodies and trailers, and parts	8.96	15.94	-0.56	-5.03	-0.69	-92.74	7.71	11.33	0.43
Other transportation equipment	2.65	4.71	0.33	3.00	0.01	0.90	2.99	4.39	0.16
Furniture and related products	0.69	1.22	0.14	1.28	0.20	26.59	1.03	1.51	0.06
Miscellaneous manufacturing	2.08	3.70	-0.08	-0.75	-0.04	-5.98	1.95	2.87	0.11

Source: CSLS calculation

Notes:

- Table based on BLS data.

Additionally, it experienced a better-than-average productivity growth contraction, leading to a negative growth effect. In conclusion, computers and electronics decreased from being the largest contributor to labour productivity growth in manufacturing to barely contributing and even slightly aiding the slowdown.

We now turn to the transportation equipment industry. In the 1997-2011 period, the motor vehicles industry contributed 0.43 points while the other transportation equipment industry contributed 0.16 points, summing to a total contribution of 0.59 points (or 15.7 per cent). This made transportation equipment the second-largest contributor to manufacturing labour productivity growth, contributing $10.7 per hour. Both motor vehicles and other transportation equipment showed positive within-sector effects, although the former to a much greater extent. However, they diverged in their growth and level effects, with the former having both negative while the latter having both positive. The reason for this was that, while both experienced higher-than-average productivity levels and growth, motor vehicles saw labour shift away while other transportation equipment saw labour shift towards it.

In 2011-2023 transportation equipment contributed only -0.01 points (or 1.7 per cent) to the overall -0.51 manufacturing labour productivity CAGR. The two sections of this industry diverged in their contributions, with motor vehicles adding 0.06 points (or -12.1 percent) and other transportation equipment adding -0.07 points (or 13.8 per cent). They both had negative within-sector effects due to experiencing a labour productivity contraction. The contraction in other transportation equipment was worse than average while that of motor vehicles was better than average, explaining their diverging growth effects (when pared with the fact that both saw increases in their labour share). More importantly, due to high productivity levels, they both saw positive level effects. The level effect for motor vehicles was the largest of any industry and solely responsible for the diverging trends between both sub-industries. While transportation equipment saw an interesting inter-industry divergence, on the aggregate the industry still barely contributed and even slightly aided the slowdown, just like the computers and electronic products industry.

The chemical products industry had the third-largest contribution in the 1997-2011 period, adding 0.50 points to the total 3.75-point labour productivity CAGR. All three of its effects were positive, reflecting better-than-average productivity levels and growth paired with a growing share of labour.

Unlike the other two, in 2011-2023 the chemical product industry's contribution to the slowdown was not benign but rather the second largest of any industry. Its contribution amounted to -0.09 points (or 18.5 per cent) to the manufacturing labour productivity CAGR of -0.51 points. Even though it initially had very high labour productivity levels, it experienced a worse-than-average growth. This paired with a positive increase in its share of labour led to negative within-sector and growth effects and a positive level effect.

Table 26 shows the largest contributors to the slowdown by taking the difference between their percentage point contributions in both periods. The slowdown was widespread, with every manufacturing industry contributing less in 2011-2023 than they did in 1997-2011. The industries which stood out were the three previously examined, namely computer and electronic products, transportation equipment, and chemical products.

Table 25: CSLS Sectoral Output Decomposition by Industry: Summary Results of Within-Sector, Re-allocation Level, and Re-allocation Growth Effects on Labour Productivity in the U.S. Manufacturing Sector, 2011–2023

	Within-Sector Effect		Re-allocation Level Effect		Re-allocation Growth Effect		Total Effect		
Industry	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Total Contribution to -0.51% CAGR (1997-2011)
Manufacturing	-15.48	100.00	3.56	100.00	-0.92	100.00	-12.85	100.00	-0.51
Food and beverage and tobacco products	-4.55	29.38	1.14	32.19	-0.31	33.74	-3.72	28.92	-0.15
Textile mills and textile product mills	-0.19	1.24	0.31	8.79	-0.03	3.45	0.09	-0.69	0.00
Apparel and leather and allied products	0.17	-1.08	0.70	19.68	-0.16	17.52	0.70	-5.48	0.03
Wood products	-0.20	1.31	-0.24	-6.75	0.04	-4.04	-0.41	3.16	-0.02
Paper products	-0.37	2.36	-0.19	-5.36	-0.03	3.09	-0.59	4.55	-0.02
Printing and related support activities	0.03	-0.21	0.68	19.03	-0.16	17.44	0.55	-4.26	0.02
Petroleum and coal products	1.90	-12.26	-2.01	-56.56	-0.23	25.16	-0.35	2.69	-0.01
Chemical products	-3.18	20.51	0.91	25.69	-0.11	12.13	-2.37	18.48	-0.09
Plastics and rubber products	-0.47	3.02	-0.02	-0.55	0.02	-2.47	-0.46	3.61	-0.02
Nonmetallic mineral products	0.02	-0.10	-0.08	-2.25	0.04	-4.74	-0.02	0.16	0.00
Primary metals	-1.43	9.25	-0.36	-10.04	0.12	-13.37	-1.67	12.96	-0.07
Fabricated metal products	-0.73	4.71	0.19	5.35	-0.04	4.10	-0.58	4.50	-0.02
Machinery	-1.82	11.78	-0.04	-1.23	0.02	-2.20	-1.85	14.37	-0.07
Computer and electronic products	**-0.51**	**3.30**	**0.04**	**1.12**	**-0.11**	**11.38**	**-0.58**	**4.48**	**-0.02**
Electrical equipment, appliances, and components	-0.42	2.71	0.00	-0.01	0.00	-0.22	-0.42	3.25	-0.02
Motor vehicles, bodies and trailers, and parts	-0.86	5.59	2.39	67.14	0.03	-3.44	1.55	-12.10	0.06
Other transportation equipment	-1.78	11.47	0.02	0.54	-0.01	1.40	-1.77	13.77	-0.07
Furniture and related products	-0.30	1.92	0.12	3.42	-0.01	1.05	-0.18	1.44	-0.01
Miscellaneous manufacturing	-0.79	5.09	-0.01	-0.21	0.00	0.02	-0.80	6.19	-0.03

Source: CSLS calculation

Notes:

- Table based on BLS data.

Other significant contributors included the food, beverage, and tobacco products; petroleum and coal; and machinery industries. These contributed fourth, fifth, and sixth to the slowdown, respectively. While all three saw moderate to large contributions in 1997-2011, all three contributed to the negative manufacturing labour productivity CAGR observed 2011-2023. The data shows that the largest contributors of the first period did not experience enough growth to offset the general descent in manufacturing labour productivity. In most cases, they actually weakly contributed to the contraction. Furthermore, no other industry rose up to take the place of the former leading industries.

Table 26: CSLS Sectoral Output Decomposition by Industry, Contributions to U.S. Manufacturing Sector Labour Productivity Growth, 1997-2023 (percentage points)

Industry	1997-2011	2011-2023	Difference
Manufacturing	3.75	-0.51	-4.27
Food and beverage and tobacco products	0.30	-0.15	-0.45
Textile mills and textile product mills	0.11	0.00	-0.11
Apparel and leather and allied products	0.10	0.03	-0.07
Wood products	0.07	-0.02	-0.08
Paper products	0.10	-0.02	-0.12
Printing and related support activities	0.08	0.02	-0.06
Petroleum and coal products	0.41	-0.01	-0.43
Chemical products	0.50	-0.09	-0.59
Plastics and rubber products	0.10	-0.02	-0.12
Nonmetallic mineral products	0.03	0.00	-0.03
Primary metals	0.15	-0.07	-0.21
Fabricated metal products	0.07	-0.02	-0.09
Machinery	0.26	-0.07	-0.34
Computer and electronic products	**0.65**	**-0.02**	**-0.67**
Electrical equipment, appliances, and components	0.08	-0.02	-0.09
Motor vehicles, bodies and trailers, and parts	0.43	0.06	-0.36
Other transportation equipment	0.16	-0.07	-0.24
Furniture and related products	0.06	-0.01	-0.06
Miscellaneous manufacturing	0.11	-0.03	-0.14

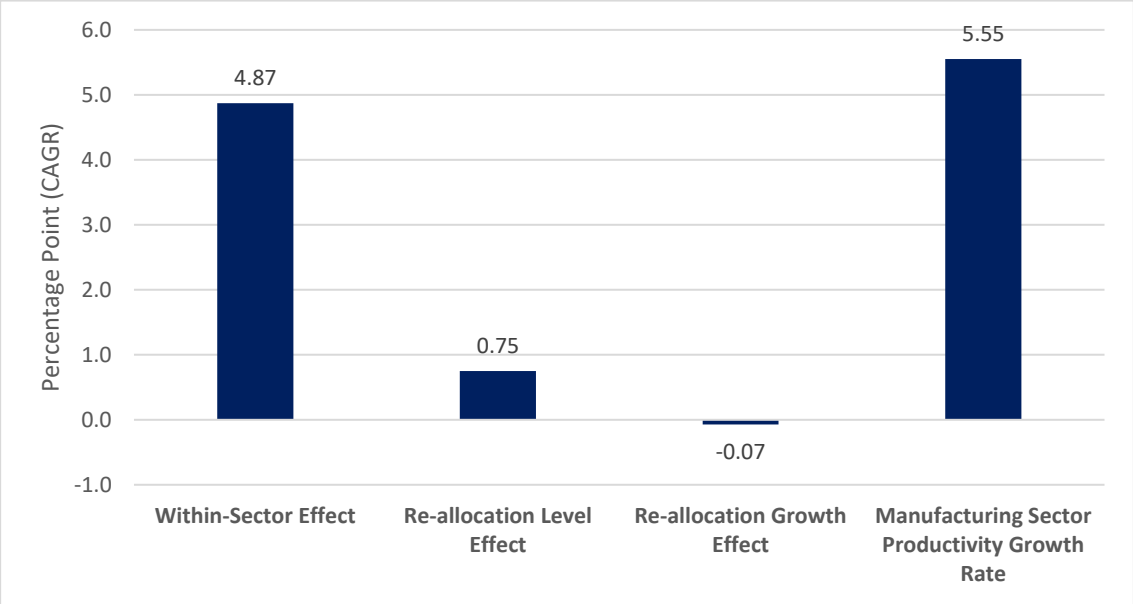
Source: CSLS calculation

CSLS (BEA) Labour Productivity Growth Decomposition

We again start by analyzing how each of the three separate decomposition effects (represented by the three summations in the CSLS decomposition formula) contributed separately to the overall labour productivity growth observed in the manufacturing sector (Chart 6). Panel A reveals that the majority of the 5.55 per cent CAGR seen in manufacturing labour productivity in 1997-2011 came from within-sector improvements (4.87 points) followed by a much smaller contributions from the re-allocation level (0.75 points). Unlike in the sectoral output decomposition, the growth effect showed a negative contribution (-0.07 points). The positive level effect and negative growth effect, tell us that labour moved towards industries with above-average initial productivity levels but below-average growth.

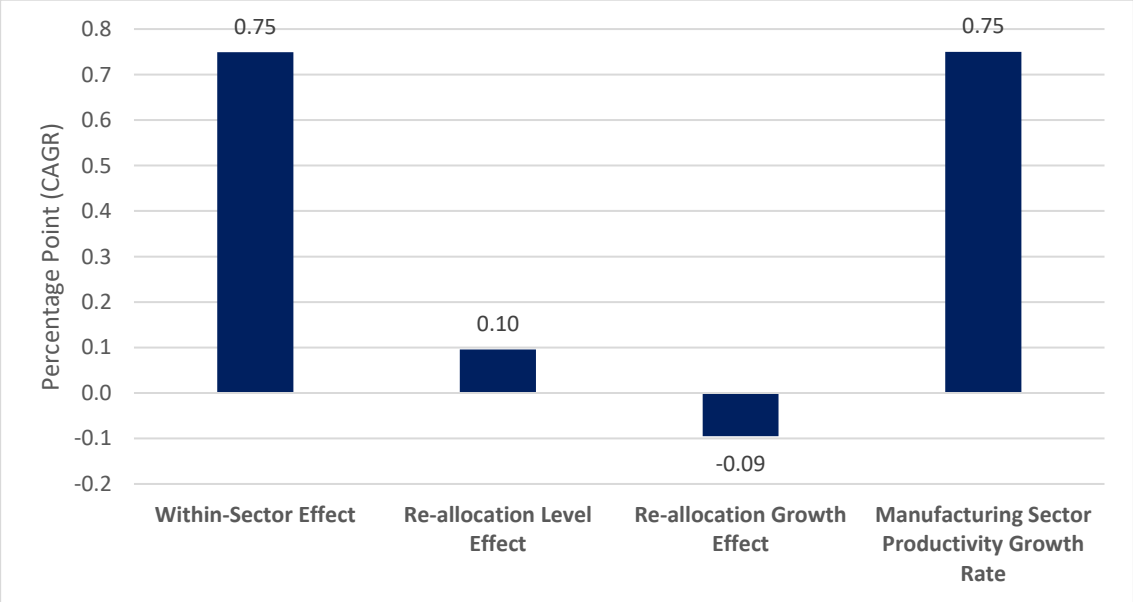
Chart 6: Absolute Contribution by Decomposition Effect to BEA Manufacturing Labour Productivity Growth, 1997-2011

Panel A: Contributions to Manufacturing Growth over 1997-2011



Source: CSLS

Panel B: Contributions to Manufacturing Growth over 2011-2023



Source: CSLS

As in the previous sectoral output decomposition, panel B indicates that the lower 0.75 per cent manufacturing labour productivity growth seen in 2011-2023 was largely the fault of the within-sector effect (0.75 points). The discrepancy between the level and growth effects indicates that, while labour did shift to those industries which were initially more productive, those industries were also more likely to observe contractions in productivity. The re-allocation effects canceled each other out in their contributions, failing to make up for the weak inter-industry labour productivity growth.

Table 27 and Table 28 decompose each manufacturing industry's labour productivity growth for a deeper productivity analysis within each industry (as opposed to the economy-wide analysis provided by Chart 6). These tables also provide percentage point contributions by industry, allowing for deeper insight into industries responsible for the growth observed in each period

In 1997-2011, the computer and electronic products industry showed the largest contribution to growth, adding 1.34 points (or 24.2 per cent) to the 5.55 per cent growth rate seen in the aggregate labour productivity sector. Due to its large share of labour and high labour productivity growth, this industry had the largest within-sector effect. Over this period, the sector lost a large share of its hours worked, leading to a negative growth effect since its productivity growth was so large. Consequently, because this industry had lower-than-average productivity levels in 1997, the labour flight led to a positive level effect.

Unlike in the previous decomposition, computers and electronic products continued to positively contribute to growth, showing a 0.42-point (or 56.0 per cent) contribution to the overall 0.75-point growth seen in manufacturing labour productivity. Its within-sector effect remained the largest of any industry, showing that productivity growth persisted—although slower than previously. Because this industry saw higher labour productivity levels and growth compared to the aggregate, losing its share of labour caused both re-allocation effects to be negative. Even with this positive contribution to growth in 2011-2023, computers and electronic products was still the main industry responsible for the slowdown.

The chemical products industry was the second-largest contributor to the manufacturing labour productivity growth seen in 1997-2011, adding 0.95 points (or 17.1 per cent). As in the sectoral output decomposition, this industry experienced a positive trend in all three effects due to having higher-than-average initial productivity levels, growth, and an increasing share of labour.

In absolute terms, this industry contributed to a much lower extent in 2011-2023, only adding 0.16 points (or 21.8 per cent) to the overall manufacturing labour productivity growth. As in the first period, it also saw positive contributions from all three effects. This was due to both higher-than-average initial productivity levels and growth in combination with a slight increase in its labour share.

Transportation equipment was the third largest contributor to growth in 1997-2011, adding 0.89 points (or 15.9 per cent) to the manufacturing labour productivity growth. Motor vehicles contributed more (0.53 points) than other transportation equipment (0.36 points). Both groups experienced productivity growth, leading to positive within-sector effects.

Table 27: CSLS Value-Added Decomposition by Industry: Summary Results of Within-Sector, Re-allocation Level, and Re-allocation Growth Effects on Labour Productivity in the U.S. Manufacturing Sector, 1997-2011

	Within-Sector Effect		Re-allocation Level Effect		Re-allocation Growth Effect		Total Effect		
Industry	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Total Contribution to 5.55% CAGR (1997-2011)
Manufacturing	31.81	100.00	4.90	100.00	-0.47	100.00	36.24	100.00	5.55
Food and beverage and tobacco products	0.56	1.77	1.17	23.87	-1.04	221.44	0.69	1.91	0.11
Textile mills and textile product mills	0.40	1.24	0.32	6.55	0.36	-77.22	1.08	2.98	0.17
Apparel and leather and allied products	0.50	1.56	0.50	10.18	0.44	-92.57	1.43	3.95	0.22
Wood products	0.78	2.44	0.09	1.79	0.06	-13.38	0.93	2.56	0.14
Paper products	0.39	1.24	-0.08	-1.56	0.07	-14.17	0.38	1.06	0.06
Printing and related support activities	0.95	2.97	0.13	2.59	0.08	-17.96	1.16	3.19	0.18
Petroleum and coal products	0.78	2.46	0.65	13.29	0.14	-30.38	1.58	4.35	0.24
Chemical products	4.53	14.24	1.15	23.55	0.51	-109.54	6.20	17.11	0.95
Plastics and rubber products	0.96	3.02	-0.01	-0.12	-0.02	3.49	0.94	2.59	0.14
Nonmetallic mineral products	0.38	1.20	0.02	0.36	-0.02	5.08	0.38	1.04	0.06
Primary metals	0.92	2.89	0.03	0.55	0.02	-5.17	0.97	2.68	0.15
Fabricated metal products	0.63	1.97	0.11	2.29	-0.44	93.39	0.30	0.83	0.05
Machinery	2.93	9.23	0.03	0.55	0.01	-2.26	2.97	8.20	0.46
Computer and electronic products	**9.07**	**28.50**	**0.49**	**9.91**	**-0.80**	**170.24**	**8.75**	**24.15**	**1.34**
Electrical equipment, appliances, and components	0.78	2.45	-0.03	-0.58	0.03	-6.58	0.78	2.16	0.12
Motor vehicles, bodies and trailers, and parts	3.57	11.22	0.05	1.07	-0.18	38.23	3.44	9.49	0.53
Other transportation equipment	1.97	6.19	0.25	5.04	0.12	-24.48	2.33	6.43	0.36
Furniture and related products	0.13	0.41	0.05	0.95	0.15	-32.17	0.33	0.91	0.05
Miscellaneous manufacturing	1.59	4.99	-0.01	-0.27	0.03	-5.99	1.60	4.42	0.25

Source: CSLS

Table 28: CSLS Value-Added Output Decomposition by Industry: Summary Results of Within-Sector, Re-allocation Level, and Re-allocation Growth Effects on Labour Productivity in the U.S. Manufacturing Sector, 2011–2023

	Within-Sector Effect		Re-allocation Level Effect		Re-allocation Growth Effect		Total Effect		
Industry	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Absolute (Chained 2017 Dollars)	Percentage (%)	Total Contribution to 0.75% CAGR (2011-2023)
Manufacturing	7.59	100.00	0.97	100.00	-0.96	100.00	7.60	100.00	0.75
Food and beverage and tobacco products	-0.41	-5.34	-0.15	-15.54	-0.19	19.52	-0.74	-9.78	-0.07
Textile mills and textile product mills	0.12	1.62	0.28	28.56	0.01	-0.83	0.41	5.37	0.04
Apparel and leather and allied products	0.32	4.24	0.32	32.98	-0.08	8.67	0.56	7.35	0.06
Wood products	-0.06	-0.74	-0.16	-16.09	-0.04	4.24	-0.25	-3.33	-0.02
Paper products	0.26	3.45	0.05	5.59	0.00	0.15	0.31	4.14	0.03
Printing and related support activities	0.02	0.22	0.39	39.97	0.07	-7.35	0.47	6.25	0.05
Petroleum and coal products	0.61	8.01	-0.41	-42.43	-0.06	6.28	0.14	1.80	0.01
Chemical products	1.11	14.61	0.51	52.87	0.03	-3.29	1.65	21.75	0.16
Plastics and rubber products	-0.48	-6.32	-0.10	-10.41	-0.06	5.74	-0.64	-8.37	-0.06
Nonmetallic mineral products	-0.21	-2.77	-0.05	-4.74	-0.04	4.03	-0.29	-3.88	-0.03
Primary metals	2.31	30.39	0.14	14.18	-0.28	29.56	2.16	28.43	0.21
Fabricated metal products	-0.94	-12.42	0.13	13.06	0.07	-6.78	-0.75	-9.88	-0.07
Machinery	-1.18	-15.48	0.02	2.17	0.10	-9.92	-1.06	-13.94	-0.10
Computer and electronic products	**4.84**	**63.83**	**-0.10**	**-10.41**	**-0.49**	**50.67**	**4.26**	**56.03**	**0.42**
Electrical equipment, appliances, and components	-0.26	-3.48	-0.02	-1.60	-0.02	2.12	-0.30	-3.94	-0.03
Motor vehicles, bodies and trailers, and parts	0.49	6.42	0.02	1.70	0.01	-0.59	0.51	6.70	0.05
Other transportation equipment	0.69	9.04	0.02	1.84	0.00	-0.38	0.71	9.31	0.07
Furniture and related products	-0.08	-1.04	0.08	8.52	0.02	-1.81	0.02	0.27	0.00
Miscellaneous manufacturing	0.44	5.76	0.00	-0.22	0.00	-0.03	0.44	5.73	0.04

Source: CSLS

Because this growth was larger-than-average for both groups, their diverging growth effects are explained by labour shifting away from motor vehicles and towards other transportation equipment. Finally, they both had positive level effects, although for separate reasons. Motor vehicles had lower-than-average productivity in 1997 while other transportation equipment had higher-than-average productivity in 1997. The resulting level effects were due to the movement of labour.

In the following period (2011-2023), the transportation equipment industry contributed significantly less, only adding 0.12 points (16.0 per cent) to the 0.75 per cent growth observed in manufacturing labour productivity. Motor vehicles contributed 0.05 points (or 6.7 per cent) and other transportation equipment contributed 0.07 points (or 9.3 per cent). Both groups experienced similar trends in all three effects, observing larger-than-average initial productivity levels in 2011 and growth throughout the period. This fact, paired with an increasing share of labour for each effect contributing positively to the overall trend.

Table 29: CSLS Value-Added Output Decomposition by Industry, Contributions to U.S. Manufacturing Sector Labour Productivity Growth, 1997-2023 (percentage points)

Industry	1997-2011	2011-2023	Difference
Manufacturing	5.55	0.75	-4.80
Food and beverage and tobacco products	0.11	-0.07	-0.18
Textile mills and textile product mills	0.17	0.04	-0.13
Apparel and leather and allied products	0.22	0.06	-0.16
Wood products	0.14	-0.02	-0.17
Paper products	0.06	0.03	-0.03
Printing and related support activities	0.18	0.05	-0.13
Petroleum and coal products	0.24	0.01	-0.23
Chemical products	0.95	0.16	-0.79
Plastics and rubber products	0.14	-0.06	-0.21
Nonmetallic mineral products	0.06	-0.03	-0.09
Primary metals	0.15	0.21	0.06
Fabricated metal products	0.05	-0.07	-0.12
Machinery	0.46	-0.10	-0.56
Computer and electronic products	**1.34**	**0.42**	**-0.92**
Electrical equipment, appliances, and components	0.12	-0.03	-0.15
Motor vehicles, bodies and trailers, and parts	0.53	0.05	-0.48
Other transportation equipment	0.36	0.07	-0.29
Furniture and related products	0.05	0.00	-0.05
Miscellaneous manufacturing	0.25	0.04	-0.20

Source: CSLS calculation

Table 29 shows industries' contributions to the slowdown by taking the difference between their contribution in both periods. Once again, the slowdown was widespread, with every industry but primary metals contributing to the slowdown. This industry contributed only 0.15 points in 1997-2011 but grew to the second-largest contributor (behind computers and electronic products) in 2011-2023, adding 0.21 points. Consistent with the sectoral output decomposition, the computer and electronic products, chemical products, and transportation equipment industries had the three largest contributions, respectively. The only other key industry which played a role in the

deceleration was the machinery industry, which went from aiding growth in 1997-2011 to actively detracting from it in 2011-2023.

The computers and electronic product industry's contribution shrank sharply in both decomposition frameworks. On a sectoral output basis, its contribution nearly vanished. However, on a value-added basis, labour productivity growth in this industry remained modestly positive. Because overall value-added manufacturing productivity growth was tiny following 2011, that small absolute contribution accounted for a larger share (56.0 per cent) of the total, representing a bigger piece of a smaller pie. This is consistent with the offshoring of material-intensive stages of manufacturing which impact sectoral output to a much greater extent than value-added output.

Section VII: Literature Review

The stagnation of labour productivity growth in the U.S. manufacturing sector since 2011 represents a significant departure from the robust expansion observed in previous decades. This section aims to examine the potential drivers behind this slowdown, drawing on contemporary economic literature, empirical studies, and sectoral analyses to provide a structured exploration of the contributing factors.

The discussion is organized around several key themes. First, it evaluates technological and innovation dynamics, including R&D effectiveness and diminishing returns in high-productivity industries. Next, the analysis considers factors impacting markets and competition such as the impacts of declining business dynamism, offshoring, cyclical influence, and the lingering effects of the Great Recession. Finally, it highlights gaps in the existing literature and areas requiring further research.

By structuring the discussion along these lines, this section aims to provide a clear understanding of the multifaceted nature of the productivity slowdown.

Computer & Electronics Industry Focus: The End of the IT Boom and Exhaustion of Technological Opportunities

The computer and electronics manufacturing industry occupies a central position in analyzes of the productivity slowdown, having served as both the primary driver of earlier growth and a major contributor to subsequent stagnation. During its peak productivity expansion from 1987 to 2005, the industry achieved an extraordinary 870 per cent increase in labour productivity, fueled largely by semiconductor innovations and quality improvements from Moore's Law[16] (Politano, 2024).

Past research by Houseman et al. (2014) provides crucial insight into how this industry's exceptional performance masked broader weaknesses. Their analysis demonstrates that real value-added in computer and electronic products manufacturing (encompassing computers, semiconductors, telecommunications equipment, and related manufacturing) grew at 22 per cent annually between 1997 and 2007. Even so, the industry accounted for only about 10-13% of nominal manufacturing value added. Excluding this industry, manufacturing real value-added growth averaged only around 1.2 per cent per year, revealing how an outsized performance in one industry masked broader weakness across U.S. manufacturing. When excluding this industry, manufacturing output growth appears relatively weak. This analysis underscores how the sector's extraordinary performance perhaps concealed broader weaknesses across U.S. manufacturing.

The sector's subsequent decline had disproportionate effects on aggregate productivity. Brill et al. (2018) identifies semiconductors and electronic components as experiencing the most severe MFP growth deceleration, falling from 17.8 per cent per year (1992-2004) to just 1.3 per cent (2004-2016), while computer and peripheral equipment manufacturing's MFP growth declined from 20.2 per cent to 6.1 per cent over the same period. Politano (2024) estimates that this industry alone

[16] Moore's Law is the observation that the number of transistors on a microchip doubles approximately every two years.

explains approximately 40 per cent of the aggregate manufacturing labour productivity slowdown during the 2010s, an observation consistent with the findings of this paper.

These compositional shifts prove particularly significant because, as Sprague (2018) shows, semiconductors and electronic components manufacturing along with computer manufacturing accounted for approximately 60 per cent of manufacturing MFP growth during 1992-2004 but contributed minimally thereafter. This dramatic reversal suggests the exceptional productivity growth of the late 1990s and early 2000s may have represented a temporary phenomenon rather than a permanent acceleration. The concept of diminishing returns to technological complexity, as advanced by Tainter (1988) and Bloom et al. (2017), provides a complementary explanation, suggesting that maintaining innovation rates requires exponentially increasing research efforts, with innovations becoming increasingly expensive because of diminishing returns—a dynamic that is particularly evident in the semiconductor industry's struggles to sustain its earlier growth trajectory.

Furthermore, the productivity slowdown has been partially attributed to the natural conclusion of the information technology (IT)-led productivity boom. Gordon (2016) conceptualizes the late 1990s surge as a temporary deviation from long-term trends, with productivity growth eventually reverting to its historical mean as the most transformative applications of IT achieved widespread diffusion by the mid-2000s (Gordon, 2013 cited in Brill et al., 2018). This interpretation finds further support in the works of Byrne, Oliner, and Sichel (2015) and Fernald (2014), which Syverson (2016) cites to explain that the "easy wins" in TFP from information technology have largely been realised. As a result, producers have entered a phase of diminishing returns from these technologies. Additionally, The Economist (2023) reinforces this view, noting that the "low-hanging fruit" of IT-driven productivity gains had mostly been exhausted by this point.

However, while some studies suggest diminishing returns to scale from IT and electronic technologies, the literature remains unclear. Cusolito and Maloney (cited in Sprague, 2021), for instance, point out that productivity gains from general-purpose technologies can emerge in multiple waves, as seen historically with electrification. The conflicting findings highlight that the current stagnation in manufacturing total factor productivity remains an open and unresolved question.

R&D, Technological Adoption, and their Relationship to Market Power and Competitive Landscapes

Lashkari and Pearce's (2025) analysis of R&D effectiveness reveal a troubling paradox: despite R&D intensity[17] increasing at 2.2-2.5 per cent annually since 1987 (R&D investment since 2010 has actually proceeded at a relatively higher intensity both in terms of inputs and outputs), manufacturing productivity growth has stagnated since 2010. This contradicts the notion that a decline in R&D spending explains the productivity slowdown. Instead, the evidence presented by the authors points to towards a decline in the effectiveness of R&D in generating productivity growth in U.S. manufacturing. To explore this further, the article examines whether differences between leader and follower firms[18] in the manufacturing sector shed light on this disconnect. Two

[17] Ratio of a firm's R&D investment to its revenue (the percentage of revenue that is reinvested in R & D).
[18] Companies that strategically observe and then rapidly imitate the innovations and strategies of market leaders.

potential behavioural effects are tested: a complacency effect, where dominant firms might reduce R&D if they feel secure from competition, and a discouragement effect, where lagging firms which are facing a widening gap might invest less due to a perceived inability to catch up. However, the data explored by Lashkari and Pearce reveals no evidence of either. Their firm-level analysis of Compustat/CRSP data shows that both leaders and followers grew R&D intensity annually by 2.5 per cent from 1987-2007 and 2.4 per cent from 2010-2022. Yet, these increases did not translate into higher manufacturing productivity growth for either group, reinforcing the core puzzle. The findings could indicate longer lags between R&D investments and their economic returns, and limitations in how output quality is captured in current measurement systems. While definitive answers remain elusive, the authors conclude that neither the discouragement nor the complacency effect is leading to declines in R&D intensity.

Complementing this issue of R&D effectiveness, international comparisons also highlight significant U.S. deficiencies in technology adoption. According to Atkinson (2023), in 2021 China had 322 industrial robots per 10,000 workers (12 times more than expected given its wage levels), while the U.S. installs only 274 (only 73 per cent of expected levels). This technology adoption gap has likely contributed to the growing productivity divergence between U.S. manufacturers and their global competitors. This technology adoption gap is particularly acute among small and medium enterprises, where U.S. government support lags dramatically behind competitors. Japan invests 55 times more in manufacturing support for small and medium-sized enterprises than the U.S., while Germany invests six times more (Atkinson, 2024).

However, even beyond trends, literature points to weakening firm-level responsiveness and reallocation to productivity improvements as another contributing factor to the slowdown. In their paper "Changing Business Dynamism and Productivity: Shocks vs. Responsiveness," Decker et al. (2018) identify a decline in the marginal employment growth response of businesses to idiosyncratic productivity shocks, particularly within the high-tech sector. They observe that the responsiveness of young firms in the post-2000 period was only about half as strong in manufacturing and two-thirds as strong economy-wide compared to peak levels in the 1990s. The authors note that the timing of this decline aligns closely with the eventual onset of the productivity slowdown; this is particularly significant given that these shifts in reallocation and responsiveness was most evident among high-tech firms, which largely overlap with IT-producing and IT-using industries—areas that had previously been key drivers of U.S. manufacturing productivity growth as explored earlier. Importantly, one of the underlying sources Decker et al. identify as contributing to these lower rates of reallocation is declining competition.

This connection between technology and competitive dynamics is further reinforced by Kurz (2017), who provides critical insight by noting that “IT innovations enable and accelerate the erection of barriers to entry, and once erected, IT facilitates the maintenance of restraints on competition.” This suggests that the very technologies that drove earlier productivity gains may have inadvertently contributed to the subsequent slowdown by enabling dominant firms to entrench their market positions and reduce competitive pressures that traditionally drive innovation and efficiency improvements.

The growing productivity divergence between frontier firms and industry laggards presents particular cause for concern. Andrews et al. (2016) demonstrate that productivity gains have become increasingly concentrated among a small subset of leading firms, while the majority of

manufacturers have stagnated and low-growth firms struggling to integrate new technologies. This pattern is especially pronounced in previously high-growth sectors like electronics manufacturing, where productivity dispersion increased sharply after 2000 (Politano, 2024).

The Impact of the Great Recession and Other Cyclical Factors

Literature also points towards the Great Recession exacerbating these technological challenges. Hall (2015) estimates that by 2013, the capital stock remained 13.2 per cent below its pre-recession trend, reflecting both the depth of the initial contraction and the weakness of the subsequent recovery of the manufacturing sector (Sprague, 2021). Ikeda and Kurozumi (cited in Sprague, 2021) argue that financial shocks tightened firms' financing, dampening R&D and technology adoption. Duval, Hong, and Timmer (cited in Sprague, 2021) find that credit-constrained firms disproportionately cut intangible investments like R&D and workforce training. Politano (2024) documents how these dynamics manifested in specific sectors; the productivity growth in the U.S. semiconductor and electronic component subsector saw significant slowdown, with computer manufacturing output plummeting nearly 50 per cent between 2008 and 2011. The sector's decline reflects both the exhaustion of previous technological drivers as well as changes due to the recession; total real sectoral output still remains 8.3 per cent below its 2008 peak (Politano, 2024), while employment contracted by approximately 42 per cent (800,000 jobs) between 2001 and 2011, representing a fundamental transformation of the U.S. manufacturing base.

The automotive industry also presents a nuanced case of productivity stagnation. While output per hour worked increased by 71 per cent from 1987 to 2005, growth slowed dramatically to just 16 per cent from 2005-2022 (Politano, 2024). The immediate post-recession period saw productivity spike for undesirable reasons, such as layoffs outpacing output declines, followed by prolonged stagnation during the recovery. Recent years have witnessed actual productivity declines due to supply chain disruptions and semiconductor shortages during COVID-19, illustrating how multiple adverse shocks can compound to create persistent productivity weakness (Politano, 2024).

Capital Intensity

Politano (2024) highlights that the contribution of capital intensity to labour productivity growth slowed significantly in the 2000s and nearly flatlined in the 2010s across most manufacturing subsectors; this stagnation reflects two decades of underinvestment in new manufacturing equipment and structures. While some industries, such as chemicals, maintained steadier capital intensity growth, other industries (particularly electronics and electrical/vehicle manufacturing) experienced sharp slowdowns or outright stagnation.

Gutiérrez and Philippon (2017) discuss the underinvestment in U.S. business sector, and attribute it to several interrelated factors. One key driver has been the rising share of intangible assets (including intellectual property, software, and R&D) in overall investment, which has crowded out funding for traditional capital expenditures. Their estimates suggest this compositional shift accounts for approximately quarter to a third of the observed investment gap. Other contributing factors include weakening competitive pressures in concentrated industries, where firms with common ownership structures have shown a tendency to reduce capital expenditures while increasing share buybacks. Additionally, evolving corporate governance norms have increasingly prioritised short-term returns over long-term investment. The prevalence of stock-based

compensation, for instance, has aligned managerial incentives with immediate shareholder returns through mechanisms like share repurchases, often at the expense of capital deepening.

While the factors discussed by Gutiérrez and Philippon are framed in the context of the broader U.S. business sector, they appear particularly relevant for manufacturing. CSLS estimates indicate that the manufacturing sector contributed 88 per cent to the overall TFP growth slowdown between 1997-2011 and 2011-2023, while Sprague (2021) similarly finds that manufacturing accounted for 65 per cent of the private nonfarm business MFP slowdown when comparing the 1997-2005 and 2005-18 periods. Therefore, the impact of the total manufacturing sector on the private business sector suggests that the investment dynamics identified by Gutiérrez and Philippon have likely contributed significantly to the sustained productivity weakness in U.S. manufacturing, representing a major structural constraint on both labour and total factor productivity growth in the sector.

Offshoring and Structural Changes

In their analysis of manufacturing sector productivity, Helper et al. (2012) identify overseas outsourcing as a key factor contributing to the slowdown, arguing that the separation of R&D from production has weakened American innovative capacity. Using battery manufacturing as a case in point, they highlight how the offshoring of manufacturing processes has allowed East Asian countries to surpass the U.S. in this field. A similar trend is observed in the semiconductor industry, where offshoring may have negatively affected adjacent sectors such as solar energy materials manufacturing.

The pharmaceutical industry also provides a paradigmatic case of how offshoring has contributed to productivity declines. Brill et al. (2018) noted that this industry (having the second-largest influence in manufacturing) experienced a 3.2 per cent annual decline in MFP from 2004-2016, driven by two interlinked phenomena: the 2011-2012 "patent cliff" that saw blockbuster drugs like Lipitor and Plavix lose patent protection, and the concurrent offshoring of active pharmaceutical ingredients manufacturing. As reported by the FDA, “approximately 80 per cent of active pharmaceutical ingredients manufacturers are located outside of the U.S.” (Brill et al., 2018).

Additionally, Gordon and Ryu’s (2025) growth accounting framework offers a broader macroeconomic perspective on the consequences of global trade shocks for U.S. manufacturing. Their analysis reveals that the “China shock,” catalysed by China’s 2001 accession to the WTO, appears to have undermined U.S. industrial leadership across nearly all manufacturing industries and not just those in traditionally low-productivity sectors. Drawing on a 19-industry dataset, the paper examines the relationship between the expansion of imports from China and other nations and the decline in U.S. manufacturing output, capital investment, and productivity. A ranking of post-2009 TFP slowdowns across these industries identifies, unsurprisingly, electronic products as the most significant contributor. However, TFP accounts for only 40 per cent of the observed slowdown, with the remaining 60 per cent attributed to an even sharper deceleration in capital deepening. Whereas manufacturing output had grown at an annual rate of 3.1 per cent from 1972 to 2001, it slowed to just 0.4 per cent annually from 2001 to 2024. In the absence of output growth, firms had little incentive to invest, leading to aging and increasingly obsolete capital stock, plant closures, and diminished adoption of modern technology. Gordon and Ryu’s (2025) findings underscore that the disappearance of output growth aligns almost exactly with China’s entry into the WTO.

Politano (2024) further reinforces Gordon and Ryu's (2025) findings by showing that computer and electronics manufacturing's share of total manufacturing shipments peaked in the early 2000s and declined sharply thereafter. As higher-productivity industries shrank and lower-productivity industries became more prominent, aggregate manufacturing productivity growth slowed (Smith, 2024). Since multifactor productivity growth is often driven by innovation, the decline in domestic production (reflected in reduced labour share) may foster an environment less conducive to innovation.

Measuring Manufacturing Productivity

Atalay et al. (2025) examine the recent growth slowdown in manufacturing productivity and challenge the accuracy of conventional productivity measurement, arguing that conventional industry accounts understate manufacturing TFP growth. To support this claim, the authors compare consumer, producer, and import price indices, each of which captures different concepts and varies in how comprehensively it accounts for quality improvements, particularly in rapidly innovating sectors like electronics. They interpret the gap between the consumer price index and the producer and import price indices as indicative of systematic under-accounting for quality enhancements. Their analysis suggests that this mismeasurement results in an understatement of TFP growth by approximately 2.3 percentage points in durable goods manufacturing and 0.7 percentage points in nondurable goods manufacturing, while no such discrepancy is observed in nonmanufacturing industries.

In a related contribution, Bridgman (2025) examines the role of rising markups in contributing to the slowdown in manufacturing productivity growth. According to Bridgman, markups are crucial to productivity measurement, as they introduce a wedge between input elasticities (required for calculating multifactor productivity) and revenue shares (used to calculate those elasticities). Moreover, rising markups may signal deeper processes that are inhibiting productivity. Theories linking increased market power to slower economic growth suggest a potential correlation between higher markups and diminished productivity gains. Using a model that estimates the user cost of capital to distinguish between normal returns and economic profit, Bridgman finds that adjusting for markups actually intensifies the measured productivity slowdown, providing a rather fascinating contrast to Atalay et al.'s (2025) findings. His analysis shows that labour input has outpaced output growth, and the impact of labour changes become even more pronounced when corrected for markups.

Gaps in the Literature, Strengths and Weaknesses of the Existing Research

The literature examined in this review demonstrates several notable strengths in its treatment of manufacturing productivity trends, with perhaps the most critical being the broad consistency of findings across studies, all of which align with and reinforce CSLS findings about the manufacturing productivity growth rate slowdown in recent decades. For example, Lashkari and Pearce (2024) also quantified the intensified slowdown particularly post-2010, noting that while labour productivity grew at an average annual rate of 3.4 per cent from 1987 to 2007, the subsequent period from 2010 to 2022 saw productivity growth turn negative (-0.5 per cent), representing a staggering 3.9 percentage points deceleration. And according to Sprague (2018), MFP registered an average decline of 0.3 per cent per year from 2004 through 2016, contrasting the 2.0 per cent average growth per year achieved from 1992 to 2004. This consensus is particularly

evident regarding the outsized role of the computer and electronics industry; research convincingly establishes the central role of the computer and electronics sector in both the 1990s productivity boom and the subsequent slowdown, with multiple studies converging on similar estimates of its contribution to aggregate trends. International comparative analyzes further underscore the anomalous nature of the U.S. experience. While manufacturing productivity growth in Taiwan, UK, Germany, and South Korea, has comparatively excelled since 2009, the U.S. and Japan have experienced persistent stagnation (Ip, 2024).

However, the literature available also contains significant weaknesses that limit its explanatory power. While studies have effectively documented the post-2000 slowdown and its correlation with the decline of the computer and electronics industry, much of the most rigorous academic research predates the last decade, leaving recent trends under-examined. A challenge in conducting this review was the scarcity of peer-reviewed studies analysing manufacturing productivity dynamics after 2010/2011 (which is around the time that productivity growth began to dip significantly), with much of the available evidence coming from government reports or economic commentaries rather than scholarly publications.

The reliance on pre-2010 data in many foundational studies means they cannot speak to more recent developments, while the focus on aggregate industry-level analysis often masks important variations between firms and regions. Methodological challenges persist in accurately measuring productivity as well, particularly in accounting for quality improvements in outputs or the contribution of intangible capital. Perhaps most importantly, the literature presents no unified theory of the productivity slowdown, with different studies emphasising technological, competitive, or structural factors without establishing their relative importance. This lack of consensus reflects both the complexity of the phenomenon and limitations in available data, suggesting opportunities for more comprehensive, interdisciplinary approaches in future research.

Section VIII: Conclusion

This report highlights the major contribution of the U.S. manufactring sector to the overall labour productivity slowdown between the 1997-2011 and 2011-2023 periods. We found that manufacturing was the largest contributor of any two-digit NAICS sector to the overall private business sector slowdown, both in labour and total factor producivity. Estimates of labour productivity based on sectoral output from the BLS and on value-added output from the BEA supported the same conclusion. Furthermore, analysis of the three-digit NAICS manufacturing industries showed that the computer and electronic products industry was a key contributor to the falloff in growth between periods. Additional key contributors to the slowdown include the transportation equipment industry—driven largely by motor vehicle production—and the machinery industry.

Growth accounting contributions provided by the BLS indicate that the contraction in manufacturing TFP was the primary cause of the sectors productivity decline, contributing 41.0 per cent to the decline. Computers and electronic products observed a disproportional contribution of TFP to its growth slowdown at 67.1 per cent. The transportation equipment industry showed varying trends across its subgroups: the motor vehicles subgroup's largest contribution was 79.0 per cent from intermediate input intensity, while the other transportation equipment subgroup's largest contribution was 41.1 per cent from TFP. Lastly, contributions to the machinery industry mirrored those seen in the overall manufacturing sector.

This examination was later complemented with comparisons to international manufacturing growth provided by three separate institutions: The Conference Board, OECD, and EUKLEMS & INTANProd. Each of these sources showed that the U.S. slowdown was particularly poor, with the U.S. ranking in the bottom quintile of performers both in terms of its 2011-2023 growth and in its deceleration between periods.

To separate the effects contributing to labour productivity growth, we provided additional analysis based on the CSLS decomposition framework. Since aggregate labour productivity can either be propped up by intra-industry productivity gains or by movements of employment to higher productivity industries, we decomposed labour productivity growth into the within-sector effect and labour re-allocation effect (the latter of which is further broken down into the level and growth effects).

Decomposition based on BLS data showed that all three effects positively contributed to growth in 1997-2011 but only the re-allocation level effect contributed in 2011-2023. In other words, during 2011-2023, the aggregate manufacturing sector saw a decline in its productivity, especially in those industries which were initially the largest contributors. In the first period, the major drivers of growth were the computer and electronic, transportation equipment, and chemical industries. In the second period, the two former industries would have an almost negligible effect on growth while the chemical products industry would be the second largest contributor to the slowdown—the first being the food, beverage, and tobacco products industry. These three industries were the largest contributors to the manufacturing labour productivity slowdown.

Decomposition based on BEA data showed that, in both periods, the within-sector and re-allocation level effects were positive while the re-allocation growth effect was negative. This indicates that intra-sectoral productivity improved both periods—although to a smaller extent in the second—and that, while labour moved to initially higher productivity industries, those industries underperformed the average. The same industries (computer and electronic products, transportation equipment, and chemical products) were responsible for a majority of the growth in both periods (unlike in the BLS analysis).

Finally, this report provided a review of existing literature to illustrate potential causes for the observed slowdown. Drawing on work from Politano (2024) and Brill et al. (2018), we underscore how the end of the IT-led productivity boom and the exhaustion of "low-hanging" technological opportunities helped to reveal broader manufacturing weaknesses. We then examined R&D effectiveness paradoxes (Lashkari & Pearce, 2025), international technology-adoption gaps (Atkinson, 2023), and the role of weakening competitive dynamics in dampening firm-level responsiveness (Decker et al., 2018; Kurz, 2017). Cyclical disruptions—most notably the Great Recession's impact on capital stocks—and structural shifts such as offshoring and underinvestment in tangible capital (Gutiérrez & Philippon, 2017; Helper et al., 2012) further compounded these trends. By comparing these qualitative insights with our quantitative decompositions, we aim to diagnoses the roots of the U.S. manufacturing productivity slowdown while also pointing toward the policy levers (renewed R&D incentives, strengthened competition policy, and targeted support for technology adoption) needed to reignite growth.

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Appendix

Tables used in Decomposition Analysis

Source: CSLS database

Table A1: Labour Hours Worked in U.S. Manufacturing Sector by Industry, 1997-2023
Panel A: Hours Worked (in millions)

	1997	2011	2023
Manufacturing	35,857	23,971	25,858
Food and beverage and tobacco products	3,507	3,303	4,022
Textile mills and textile product mills	1,337	484	383
Apparel and leather and allied products	1,373	364	235
Wood products	1,294	719	887
Paper products	1,313	802	703
Printing and related support activities	1,629	905	721
Petroleum and coal products	284	241	230
Chemical products	2,013	1,598	1,814
Plastics and rubber products	1,891	1,293	1,482
Nonmetallic mineral products	1,114	774	906
Primary metals	1,372	842	782
Fabricated metal products	3,526	2,771	2,882
Machinery	3,109	2,203	2,256
Computer and electronic products	3,798	2,182	2,079
Electrical equipment, appliances, and components	1,214	727	817
Motor vehicles, bodies and trailers, and parts	2,588	1,486	2,142
Other transportation equipment	1,672	1,383	1,514
Furniture and related products	1,277	725	738
Miscellaneous manufacturing	1,545	1,169	1,267

Panel B: Share of Total Hours (%)

	1997	2011	2023
Manufacturing	100.00	100.00	100.00
Food and beverage and tobacco products	9.78	13.78	15.56
Textile mills and textile product mills	3.73	2.02	1.48
Apparel and leather and allied products	3.83	1.52	0.91
Wood products	3.61	3.00	3.43
Paper products	3.66	3.35	2.72
Printing and related support activities	4.54	3.78	2.79
Petroleum and coal products	0.79	1.00	0.89
Chemical products	5.61	6.67	7.02
Plastics and rubber products	5.27	5.40	5.73
Nonmetallic mineral products	3.11	3.23	3.50
Primary metals	3.83	3.51	3.02
Fabricated metal products	9.83	11.56	11.15
Machinery	8.67	9.19	8.72
Computer and electronic products	10.59	9.10	8.04
Electrical equipment, appliances, and components	3.39	3.03	3.16
Motor vehicles, bodies and trailers, and parts	7.22	6.20	8.28
Other transportation equipment	4.66	5.77	5.86
Furniture and related products	3.56	3.02	2.85
Miscellaneous manufacturing	4.31	4.87	4.90

Panel C: Percentage Share of Hours Worked Increase

	1997-2011 Change	2011-2023 Change
Manufacturing	0.00	0.00
Food and beverage and tobacco products	4.00	1.78
Textile mills and textile product mills	-1.71	-0.54
Apparel and leather and allied products	-2.31	-0.61
Wood products	-0.61	0.43
Paper products	-0.32	-0.63
Printing and related support activities	-0.77	-0.99
Petroleum and coal products	0.21	-0.11
Chemical products	1.05	0.35
Plastics and rubber products	0.12	0.33
Nonmetallic mineral products	0.12	0.27
Primary metals	-0.31	-0.49
Fabricated metal products	1.73	-0.41
Machinery	0.52	-0.47
Computer and electronic products	-1.49	-1.07
Electrical equipment, appliances, and components	-0.35	0.12
Motor vehicles, bodies and trailers, and parts	-1.02	2.08
Other transportation equipment	1.11	0.08
Furniture and related products	-0.54	-0.17
Miscellaneous manufacturing	0.56	0.02

Table A2: Labour Productivity in U.S. Manufacturing Sector by Industry, 1997-2023
Panel A: Labour Productivity Levels (real sectoral output per hour worked chained 2017 dollars)

	1997	2011	2023
Manufacturing	95.17	159.44	149.93
Food and beverage and tobacco products	197.95	223.79	190.78
Textile mills and textile product mills	70.48	101.08	91.57
Apparel and leather and allied products	63.17	45.19	56.14
Wood products	78.67	103.55	96.78
Paper products	138.44	189.73	178.79
Printing and related support activities	67.35	90.93	91.78
Petroleum and coal products	1459.97	1928.61	2117.71
Chemical products	311.19	421.26	373.63
Plastics and rubber products	118.65	153.62	144.97
Nonmetallic mineral products	113.87	130.31	130.79
Primary metals	156.49	232.50	191.73
Fabricated metal products	94.17	113.42	107.11
Machinery	114.59	168.83	149.00
Computer and electronic products	44.06	155.70	150.10
Electrical equipment, appliances, and components	116.93	159.09	145.26
Motor vehicles, bodies and trailers, and parts	149.85	273.97	260.02
Other transportation equipment	125.16	181.97	151.21
Furniture and related products	68.82	88.11	78.31
Miscellaneous manufacturing	80.43	128.73	112.56

Panel B: Absolute Change in Labour Productivity (real sectoral output per hour worked, chained 2017 dollars)

	1997-2011 Change	2011-2023 Change
Manufacturing	64.27	-9.51
Food and beverage and tobacco products	25.84	-33.01
Textile mills and textile product mills	30.61	-9.52
Apparel and leather and allied products	-17.99	10.95
Wood products	24.88	-6.77
Paper products	51.29	-10.94
Printing and related support activities	23.58	0.84
Petroleum and coal products	468.63	189.10
Chemical products	110.07	-47.63
Plastics and rubber products	34.97	-8.65
Nonmetallic mineral products	16.43	0.48
Primary metals	76.01	-40.77
Fabricated metal products	19.26	-6.31
Machinery	54.24	-19.83
Computer and electronic products	111.64	-5.60
Electrical equipment, appliances, and components	42.16	-13.83
Motor vehicles, bodies and trailers, and parts	124.12	-13.95
Other transportation equipment	56.81	-30.77
Furniture and related products	19.29	-9.80
Miscellaneous manufacturing	48.30	-16.17

Panel C: Labour Productivity Levels (real value-added output per hour worked chained 2017 dollars)

	1997	2011	2023
Manufacturing	38.46	81.95	89.64
Food and beverage and tobacco products	67.71	73.49	70.54
Textile mills and textile product mills	19.69	30.30	36.40
Apparel and leather and allied products	16.85	29.80	50.97
Wood products	24.11	45.62	43.74
Paper products	62.60	73.33	81.15
Printing and related support activities	21.94	42.75	43.20
Petroleum and coal products	344.60	443.56	504.14
Chemical products	148.07	228.78	245.41
Plastics and rubber products	33.56	51.76	42.87
Nonmetallic mineral products	52.90	65.23	58.73
Primary metals	29.77	53.82	119.48
Fabricated metal products	44.96	51.32	43.17
Machinery	43.61	77.45	64.67
Computer and electronic products	5.82	91.41	144.62
Electrical equipment, appliances, and components	46.50	69.55	60.86
Motor vehicles, bodies and trailers, and parts	33.31	82.74	90.60
Other transportation equipment	60.76	102.96	114.84
Furniture and related products	29.82	33.51	30.89
Miscellaneous manufacturing	36.07	72.87	81.84

Panel D: Absolute Change in Labour Productivity (real value-added output per hour worked, chained 2017 dollars)

	1997-2011 Change	2011-2023 Change
Manufacturing	43.49	7.69
Food and beverage and tobacco products	5.77	-2.94
Textile mills and textile product mills	10.60	6.10
Apparel and leather and allied products	12.95	21.17
Wood products	21.51	-1.88
Paper products	10.73	7.82
Printing and related support activities	20.81	0.45
Petroleum and coal products	98.97	60.58
Chemical products	80.71	16.63
Plastics and rubber products	18.20	-8.89
Nonmetallic mineral products	12.34	-6.51
Primary metals	24.05	65.66
Fabricated metal products	6.37	-8.15
Machinery	33.85	-12.78
Computer and electronic products	85.59	53.21
Electrical equipment, appliances, and components	23.05	-8.70
Motor vehicles, bodies and trailers, and parts	49.44	7.86
Other transportation equipment	42.20	11.89
Furniture and related products	3.69	-2.62
Miscellaneous manufacturing	36.79	8.97