Research

The Labor Force and Output Consequences of the Opioid Crisis

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EXECUTIVE SUMMARY

This study examines the labor market and economic consequences of the opioid crisis. While previous studies have estimated economic costs of the opioid epidemic, none has taken into account the most significant way opioid dependency is likely impacting the U.S. economy: its impact on labor force participation. This study measures the direct cost on the economy of opioids leading workers out of the labor force. Specifically, it estimates the number of workers who are absent from the labor force due to opioids, the loss of hours at work, and the resulting decline in real output. It finds:

- In 2015, 919,400 prime-age individuals were not in the labor force due to opioids;
- Between 1999 and 2015, the decline in labor force participation cumulatively cost the economy 12.1 billion work hours; and
- During that period, the reduction in work hours slowed the real annual economic growth rate by 0.2 percentage points, cumulatively costing $702.1 billion in real output.

INTRODUCTION

America's growing dependency on painkillers has evolved into a full-blown crisis. In particular, millions of people have developed opioid-related substance abuse disorders, leading to a rapid rise in opioid overdoses. In 2016 alone, over 42,000 people died after overdosing on opioids, a 28 percent increase from 2015.[1] Moreover, in 2016, for every fatal opioid overdose, there were over 30 nonfatal overdoses.[2]

While the opioid crisis poses clear health problems, it is likely also negatively affecting the U.S. economy. The recent decline in the labor force participation rate of prime-age workers (ages 25 to 54) is a major factor restricting long-run economic growth, and research suggests that opioid dependency is a principal reason these individuals are leaving the workforce. This study estimates how many prime-age workers are absent from the labor force due to opioid dependency, the loss of hours at work, and the resulting decline in real (inflation-adjusted) economic output. It finds that from 1999 to 2015, opioids steadily drew workers out of the labor force. By 2015, 919,400 prime-age workers were out of the labor force due to opioids. Between 1999 and 2015, this decline in labor force participation cumulatively cost the U.S. economy 12.1 billion work hours and $702.1 billion in real output ($43.9 billion per year).

OVERVIEW OF THE OPIOID CRISIS

Fueled by the proliferation of opioid prescriptions and exacerbated by an inundation of illegal and even more dangerous opioids, addiction has grown rapidly in recent years. The result has been an abrupt escalation in drug overdose deaths: In 2016, 42,249 Americans died (116 per day) from opioid-related drug overdoses. Since 1999, annual opioid overdose fatalities have risen by 425 percent or 10 percent per year.[3],[4] Moreover, the growth in annual opioid overdose fatalities has been accelerating: 8 percent in 2013, 14 percent in 2014, 16 percent in 2015, and 28 percent in 2016.[5] This increase has contributed to the first decline in U.S. life expectancy since the height of the AIDS epidemic in 1993.[6]

Initial exposure to opioids generally occurs when patients receive prescription opioid painkillers from their doctors. Since the turn of the century, legal prescription opioids have become far more abundant. From 1999 to 2015, prescription opioid sales per capita rose 356 percent, or 10 percent annually.[7] Moreover, many individuals receive prescriptions from multiple sources, including several doctors and pharmacies as well as family and friends.[8] These trends have led to an increased supply of prescription opioids in the United States, and this overabundance commonly leads to opioid use disorders (OUDs) and overdoses. In 2016, 2.1 million Americas had OUDs[9] and 14,500 people died after overdosing on prescription opioids.[10]

Meanwhile, a rising supply of illegal synthetic opioids and heroin has deepened dependency and hampered efforts to address the epidemic. Synthetic opioids, like fentanyl and carfentanil, have become common in the United States. The dark web has made it easy for users to find these drugs, which are often manufactured in China and enter the country through Mexico or via U.S. mailing services.[11],[12] Consequently, efforts to cut patients off from prescription opioids have backfired when those patients turn to illegal opioids. This

shift has had lethal results, as fentanyl is 50 times more potent than heroin and 100 times more potent than morphine, while carfentanil is 100 times more potent than fentanyl.[13] As a result, deaths caused by synthetic opioids and heroin have risen rapidly. From 2010 to 2016, annual deaths due to synthetic opioid and heroin overdoses have, on average, grown by 36 percent and 31 percent per year, respectively. Fatalities due to overdoses of synthetic opioids have grown particularly quickly in just the past three years, increasing by 79 percent in 2014, 73 percent in 2015, and 103 percent in 2016.[14]

PREVIOUS RESEARCH ON ECONOMIC COSTS OF THE OPIOID CRISIS

While the health consequences of this epidemic are abundant, opioid dependency is also likely negatively impacting the U.S. economy. Workers on opioids are less productive; employers in opioid-affected areas have difficulty finding dependable workers and filling job openings; and, perhaps most important, working-age adults addicted to opioids are often absent from the labor market.

Previously, three widely cited studies have estimated costs associated with the opioid epidemic. The estimates derived in each, however, do not measure how opioid dependency is impacting economic output (i.e. gross domestic product, or GDP), which is the standard measure of the U.S. economy. Instead, all three combine a cost that does slow economic growth (i.e. lost productivity) with costs that do not (e.g. spending on health care and criminal justice) in order to derive a total cost estimate. By adding those two types of costs together, each study produces a number that cannot be interpreted as a reduction in GDP.

Researchers from the Centers for Disease Control (CDC) estimated the economic costs in 2013 of the opioid epidemic to be $78.5 billion.[15] Part of that cost estimate comes from a reduction in productivity due to opioids, an effect that does slow economic growth. But, a large portion of the cost estimate is cost burdens that opioid dependency places on individuals. In particular, the CDC's $78.5 billion cost estimate includes individual spending on health care, substance abuse treatment, and legal expenses. While these may be burdens that individuals face because of opioids, they are not estimates of a loss in economic activity. If anything, an economic analysis would likely find that the spending on health care and criminal justice has a positive impact on economic growth. Thus, the CDC's $78.5 billion cost estimate does not translate to $78.5 billion in lost economic output.

Meanwhile, the Council of Economic Advisers (CEA) estimated the economic costs of the opioid epidemic to be $504 billion in 2015.[16] Yet, most of the CEA's estimate is based on welfare costs associated with drug overdose fatalities. In particular, the CEA employs "value

of statistical life" (VSL), a metric that federal agencies often use to quantify the benefits of a regulation that reduce fatalities. VSL represents the value of an individual's life and is measured by estimating the amount that society is willing to pay for a single individual to continue living. It is intended to standardize the concept of a life's value: When performing cost-benefit analyses of regulations that reduce fatalities, federal agencies often weigh the regulatory cost burdens of a new safety measure against VSL as a welfare measure of lives saved.

VSL, however, does not represent the lifetime output of an individual. While applying VSL to opioid overdose deaths does provide a standard measure of the welfare lost to society, the CEA does not estimate the lost economic output due to those deaths. Moreover, like the CDC study, the CEA's cost estimate also includes health care and legal costs. The only part in the CEA's estimate that does reflect a slowdown in economic output is lost productivity, which accounts for only a small portion of the overall cost estimate.

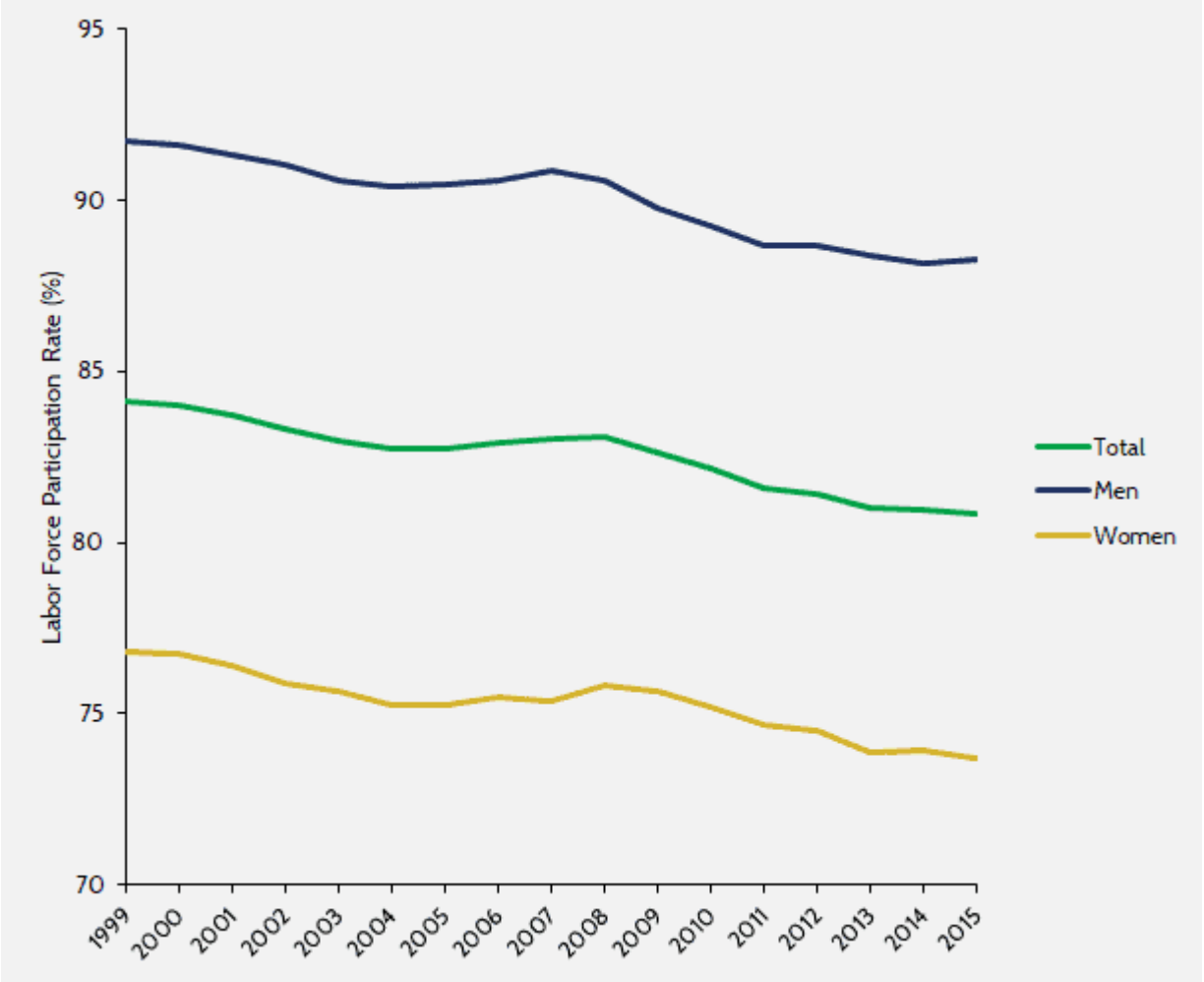
Most recently, Altarum estimated that since 2001 the opioid crisis has imposed over $1 trillion in economic costs.[17] While the study incorporates more economic costs than the CDC and CEA reports, it suffers from the same limitations by combining different kinds of costs. The Altarum estimate contains both the reduction in productivity among those still in the labor force and the lost lifetime production from opioid-related fatalities, both of which negatively impact economic output. Like the other studies, however, Altarum also combines those costs with costs that do not negatively impact GDP: spending on health care, criminal justice, and education.

As a result of these methodological limitations, no study has quantified how opioid dependency is impacting economic growth. With real GDP stuck at a 2 percent annual growth rate, it is vital to understand how much opioid dependency is contributing to this stagnation.

DECLINING LABOR FORCE PARTICIPATION AND THE ROLE OF OPIOIDS

While each previous study does measure lost worker productivity due to opioids, none quantified the most likely way opioid dependency is harming the U.S. economy: its impact on labor force participation. Individuals addicted to opioids commonly drop out of the labor market, and opioid dependency is most prevalent among prime-age individuals (those ages 25 to 54).[18] From 1999 to 2015, the rapid rise in prescription opioids coincided with a steady decline in the prime-age labor force participation rate. Chart 1 illustrates this decline.

Chart 1: Labor Force Participation Rate of Prime-Age Workers, 1999-2015



Between 1999 and 2015, prescription opioid sales per capita rose 356 percent (10 percent annually).[19] During that same time period, the labor force participation rate for prime-age workers declined from 84.1 percent to 80.9 percent. For prime-age men it declined from 91.7 percent to 88.3 percent and for women it declined from 76.8 percent to 73.7 percent.

While there are many reasons the prime-age labor force participation rate has been declining, research suggests that opioid dependency is a primary cause.[20] Former CEA Chairman Alan Krueger found that nearly half of the prime-age men who are not in the labor force take pain medicine daily. Of those taking pain medicine, two thirds use prescription painkillers.[21] In addition, Krueger found statistically significant evidence that the rise in opioid prescriptions is tied to the decline in the prime-age labor force participation rate for both men and women. His results suggest that the increase in opioid prescriptions between 1999 and 2015 could account for 20 percent of the decline in the prime-age male and 25

percent of the decline in the prime-age female labor force participation rate over that period.[22]

LABOR AND OUTPUT DECLINES DUE TO OPIOID DEPENDENCY

This study applies Krueger's results to labor force statistics to quantify the number of individuals absent from the labor force due to opioids. It then uses hours data to estimate the number of work hours lost due to opioids and productivity data to estimate the resulting loss in real (inflation-adjusted) output.

Data and Methodology

This study uses a combination of data from the Bureau of Labor Statistics (BLS), in particular labor force and unemployment statistics from the Current Population Survey (CPS)[23] and hours and productivity statistics from the multifactor productivity program.[24] It then applies the implications of Krueger's results to these data. Specifically, this study analyzes the same period examined by Krueger (1999 to 2015) and assumes that during those years, 20 percent of the decline in the prime-age male and 25 percent of the decline in the prime-age female labor force participation rate was due to opioids.

To estimate the number of workers who were absent from the labor force due to opioids, this study first estimates the total loss of workers that is associated with the decline in the prime-age labor force participation rate between 1999 and 2015. An analysis of CPS labor force and population statistics provides a calculation of the number of additional prime-age workers each year who would have been in the labor force had the participation rate remained at its 1999 level instead of declining. In 1999, 84.1 percent of all prime-age individuals, 91.7 percent of prime-age men and 76.8 percent of prime-age women, were in the labor force. In each subsequent year, the analysis calculates the difference between the actual number of workers who were in the labor force and the number of prime-age individuals who would have been in the labor force had the participation rates remained at the 1999 levels. The resulting figures represent the total number of individuals who were absent from the labor force each year due to the declining participation rate. The study then applies Krueger's research by assuming that each year 20 percent and 25 percent of these prime-age men and women, respectively, were absent from the labor force due to opioid dependency.

Next, to determine the resulting loss in real economic output, the study estimates for each year the number of these individuals who would have been employed had they been in the labor force. To do so, the study uses each year's average unemployment rate for prime-age

men and women, as measured by the CPS, and assumes that the workers not in the labor force due to opioids would have had the same unemployment rate. Then, using historical annual data from the BLS's multifactor productivity program, the study multiplies average annual hours worked per each employed person by the loss of employed people due to opioids.[25] Finally, the study multiplies the average labor productivity (average real output per hour worked)[26] by total hours lost to estimate the total real output lost due to opioids.

Decline in Labor Participation and Employment Due to Opioids

By 2015, the overall decline in the labor force participation rate of prime-age individuals translated to a loss of over 4.1 million workers. Table 1 contains the total loss of workers associated with the decline in the prime-age labor force participation rate for each year from 1999 to 2015 (each year's total is the increase relative to 1999, not the previous year). The figures in this table effectively represent the total number of additional prime-age workers who would have been in the labor force had the participation rate remained at the 1999 level each year. Since all changes are measured relative to the 1999 participation rate, for that year there are no measured impacts of opioids. Hence, in the following tables, the impact of opioids on labor, employment, work hours, and real output are all 0 for 1999.

Table 1: Decline in Prime-Age Labor Force Participation, 1999-2015

Year	Men	Women	Total
1999	0	0	0
2000	64,100	41,000	105,100
2001	253,700	247,700	501,400
2002	419,600	569,600	989,200
2003	691,700	715,700	1,407,400
2004	800,300	955,200	1,755,600
2005	770,100	976,100	1,746,200
2006	719,100	837,900	1,557,000
2007	558,800	906,500	1,465,200
2008	724,200	619,800	1,344,000
2009	1,211,000	730,000	1,940,900

2010	1,554,800	1,002,400	2,557,200
2011	1,873,800	1,351,500	3,225,300
2012	1,864,200	1,451,900	3,316,100
2013	2,034,900	1,842,700	3,877,600
2014	2,175,700	1,816,400	3,992,100
2015	2,129,400	1,973,900	4,103,300

The steady decline in the labor force participation rate coincided with an increase in the population of prime-age individuals. The consequence has been a loss of millions of workers. In 2015, there were 4.1 million fewer workers in the labor force than there would have been had the prime-age participation rate remained at the 1999 rate of 84.1 percent. Of those workers, 2.1 million were men and 2 million were women.

Applying Krueger's research suggests that in 2015 nearly a million of those workers were not in the labor force due to opioid dependency. Table 2 contains the number of workers absent from the labor force due to opioid dependency each year from 1999 to 2015. It also contains the number of those absent workers who would have been employed, based on unemployment rates for prime-age men and women for each year during the period.

Table 2: Workers and Employed Workers Who Left the Labor Force Due to Opioids, 1999-2015

Year	Men		Women		Total		
	Labor Force	Employed	Labor Force	Employed	Labor Force	Employed	
1999	0	0	0	0	0	0	
2000	12,800	12,400	10,300	9,900	23,100	22,400	
2001	50,700	48,900	61,900	59,500	112,700	108,400	
2002	83,900	79,900	142,400	135,600	226,300	215,500	
2003	138,300	131,100	178,900	170,300	317,300	301,500	
2004	160,100	152,800	238,800	228,000	398,900	380,800	
2005	154,000	148,000	244,000	233,300	398,100	381,300	

2006	143,800	138,600	209,500	201,300	353,300	339,900	
2007	111,751	107,600	226,600	218,000	338,400	325,600	
2008	144,800	137,600	155,000	147,800	299,800	285,300	
2009	242,200	219,700	182,500	169,400	424,700	389,100	
2010	311,000	282,200	250,600	231,100	561,600	513,200	
2011	374,800	344,100	337,900	312,100	712,600	656,200	
2012	372,800	347,100	363,000	337,100	735,800	684,200	
2013	407,000	381,100	460,700	431,800	867,700	812,900	
2014	435,100	412,800	454,100	429,900	889,200	842,800	
2015	425,900	407,300	493,500	471,000	919,400	878,200	

Assuming that 20 percent of the decline in the prime-age male labor force participation rate and 25 percent of the decline in the prime-age female rate was due to opioids, by 2015 opioids kept 425,900 prime-age men and 493,500 prime-age women out of the labor force. In total, opioids kept 919,400 individuals from the labor force. So, of the 4.1 million individuals absent from the labor force because of the declining labor force participation rate, nearly 1 million were not employed or looking for work specifically because of opioids.

Using the reported unemployment rates of prime-age workers for each gender reveals that, had these workers been in the labor force, the vast majority would have been employed. In particular, not only did opioids keep 919,400 prime-age workers out of the labor force in 2015, but they also resulted in a loss of 878,200 employees. 407,300 were men and 471,000 were women.

Decline in Work Hours

The reduction in employees resulted in billions of foregone work hours. Table 3 contains the hours lost from individuals remaining absent from the labor force due to opioids.

Table 3: Work Hours Lost Due to Opioids, 1999-2015

Year	Average Hours Per Employed Person	Decline in Hours (in millions)		
		Men	Women	Total

1999	1,745.9	0.0	0.0	0.0
2000	1,733.8	21.6	17.2	38.8
2001	1,709.5	83.5	101.7	185.3
2002	1,706.0	136.2	231.4	367.6
2003	1,698.0	222.7	289.2	511.9
2004	1,696.8	259.3	386.8	646.1
2005	1,694.0	250.6	395.3	645.9
2006	1,697.6	235.3	341.7	577.0
2007	1,693.9	182.3	369.3	551.6
2008	1,684.7	231.8	249.0	480.7
2009	1,659.3	364.6	281.0	645.6
2010	1,677.4	473.3	387.6	860.9
2011	1,685.0	579.8	525.8	1,105.6
2012	1,688.8	586.1	569.3	1,155.5
2013	1,686.6	642.8	728.3	1,371.0
2014	1,690.4	697.8	726.7	1,424.6
2015	1,689.6	688.2	795.7	1,483.9
Cumulative	**N/A**	**5,655.9**	**6,396.0**	**12,051.9**

Multiplying average annual hours worked per employed person by the reduction in employment yields the hours of work that would have occurred had opioids not pulled so many workers out of the labor force. In 2015, the economy lost 1.5 billion hours of work because of opioids. That is equivalent to 0.7 percent of all hours worked in the private sector that year. Between 1999 and 2015, the work hours lost due to opioids escalated as the drugs pulled more and more workers out of the labor force. Cumulatively, from 1999 to 2015, the economy lost 12.1 billion work hours, 5.7 billion from absent male and 6.4 billion from absent female prime-age workers.

Decline in Real Output

The billions of lost work hours translated to a major drag on the U.S. economy. Table 4 contains the annual and cumulative reduction in real output due to the opioid crisis from 1999 to 2015.

Table 4: Decline in Output Due to Opioid Dependency, 1999-2015 (2009 dollars)

Year	Labor Productivity	Decline in Output (billions)		
		Men	Women	Total
1999	$44.6	$0.0	$0.0	$0.0
2000	$46.2	$1.0	$0.8	$1.8
2001	$47.6	$4.0	$4.8	$8.8
2002	$49.6	$6.8	$11.5	$18.3
2003	$51.6	$11.5	$14.9	$26.4
2004	$53.2	$13.8	$20.6	$34.4
2005	$54.4	$13.6	$21.5	$35.1
2006	$54.9	$12.9	$18.8	$31.7
2007	$55.8	$10.2	$20.6	$30.8
2008	$56.2	$13.0	$14.0	$27.0
2009	$58.2	$21.2	$16.3	$37.6
2010	$60.1	$28.4	$23.3	$51.7
2011	$60.1	$34.8	$31.6	$66.4
2012	$60.5	$35.4	$34.4	$69.9
2013	$60.9	$39.1	$44.3	$83.5
2014	$61.3	$42.8	$44.5	$87.3
2015	$61.8	$42.5	$49.1	$91.6

Cumulative	**N/A**	**$331.0**	**$371.1**	**$702.1**

Over time, declining prime-age labor force participation due to opioids has become a rising cost to the economy. In 2000, the slight decline in the prime-age labor force participation due to opioids reduced real output by $1.8 billion. By 2015, the economy lost $91.6 billion in real output because of opioids. This growing economic cost also translates into a major cumulative burden on the economy: From 1999 to 2015, the U.S. economy on average lost $43.9 billion per year and cumulatively lost $702.1 billion in real economic output due to the labor market implications of opioid dependency. Since the opioid crisis has pulled more prime-age women than prime-age men out of the labor force, most of the lost output was due to the loss of prime-age female workers. In particular, the decline in prime-age female labor force participation translated to a cumulative cost of $371.1 billion and the loss of prime-age men cost the economy $331 billion total.

To put these figures in perspective, consider that the average annual lost output of $43.9 billion equates to $140 per U.S. resident. The $91.6 billion lost in 2015 translates to $290 per resident.[27] Moreover, between 1999 and 2015, real GDP grew at an annual compounded rate of 2 percent. Had opioid dependency not drawn so many workers out of the labor force, real GDP would have grown at a 2.2 percent rate, a 0.2 percentage point (or 10 percent) increase in the economy's growth rate.[28]

CONCLUSION

The U.S. economy depends on prime-age workers because they are among the most productive workers in the labor force. Yet, the growth of opioid dependency over the past two decades has contributed to the falling labor force participation rate of prime-age workers. Applying research on prescription opioids' impact on prime-age workers, this study found that opioid dependency was responsible for the absence of nearly 1 million prime-age workers from the labor force. Moreover, the decline in prime-age labor due to opioids between 1999 and 2015 has resulted in a cumulative loss of 12.5 billion work hours and $702.1 billion in real output, slowing the real annual economic growth rate by 0.2 percentage points. As policymakers consider ways to grow the economy and boost the labor supply, addressing the opioid epidemic should be part of the solution.

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[25] The historical multifactor productivity tables provide total employment and total hours worked for each year in the private sector. The authors of this report derive average hours worked per employed person in the private sector by dividing total hours by employment.

[26] Using the multifactor productivity tables, the authors derive real output per hour (labor productivity) by dividing private sector real value-added output by private sector total hours worked.

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