



TO STUDY PRODUCTIVITY GROWTH IN CONSTRUCTION INDUSTRY -REVIEW

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ABSTRACT

All over the world it was very challenging problem for construction industries to measure the construction industry productivity growth because consistent production deflator was unusual. To know the better measurement of productivity growth from the Bureau of Labor Statistics research group reported first by this paper. Where deflators were not present, a positive productivity growth was shown by the results in industries. As per quantitative data the reduction in productivity growth due to shifting of labor was found 0.4% per year. The Productivity was reduced only 0.1% per year because of regulation which influence the productivity negatively. In construction industry undocumented immigrants are more essential which work off the books. It was concluded only 0.1% per year productivity growth is observed with presence of increase unauthorized labors. More ever it is noted that all factors together cannot explain productivity less growth in construction as compared to the rest of economy. Thus, it is recommended to include new industries like schools, warehouses, and industries of contractor etc. to study it in broader range.

Keyword's: Productivity growth, Quantitative data, Regulation, Construction Industry, undocumented immigrants

I. INTRODUCTION:

In order to improve the productivity growth in the construction industries many researchers such as [1,2] have been worked. The program named Producer price index, the Bureau of Labor Statistics new measurements for output prices were issued. In this publication due to interests of public and new information relevant, to more estimated productivity growth one of the important obstacles were removed. In construction the productivity growth was improved by the research team convinced by the productivity office in 2012. Four industries reliable measured were prepared and the data were available at all industries after careful and strong analysis. The one and only center data source of construction censuses [3] was available and output and inputs information was provided consistently. This censuses was selected to use because in five years censuses were done one time and different sources were used to interpolate the productivity in between years. The Productivity growth was found negative in construction industries as investigated by the previous research, both in united states [4]. This causes because in the sector of construction and individually due to larger number of unusual deflators and quite inaccurate productivity growth past estimates. Due to negative productivity trends different question were raised such as with in construction industry shifted [5], Land used regulation increase [6], and questionable deflators use. Regulation increase, shifting of industries and undocumented migrants effected the productivity growth were investigated in this review paper.

II. INDUSTRIES SHIFTING:

For family members having single, official, industrial, hospitals and education buildings the [V] used data to know the shifting among industries. Allen observed the productivity growth of labor in overall construction sector between 1968 and 1978 was negative due to rapid growth of low portion of productivity. His study showed the over decade that shifting among industries reduced the productivity up to 4.5% and calculated per year it was 0.44% per year. For shifting among industries Allen used data of Single family, hospitals, and education and industrial buildings. This paper mainly focused on the shifting of labor within industries. There were two main reasons due to which labors input were focused more such as firstly due to nonexistent of deflators the measurement of outputs was not done accurately over time. Secondly to consider the ship between the 31 North American Industrial Classification System (NAICS) construction industries it was useful, not only the

three major groups investigated by Allen. This Paragraph did not measure the industry distribution of labor group but studied the shifts among industries. To know the effect on productivity growth by shifting of labor, the identity was considered.

$$O\bar{L} = \sum_{i=1}^{31} shl_i(O/L)_i \quad (1)$$

$O\bar{L}$: Represent over all NAICS construction industries Labor productivity

$(O\bar{L})_i$: In each 31 industries labor productivity sum

Shl_i : Share of overall labor input by weight observed in each industry i.

First of all, by using each industry labor weight of 1987, we find the relationship of above equation for 1987 to better know the likely impact of labor inputs in shifting among industries. If used the weight of labor input 2012 instead of 1987 what was the labor input in shifting. The study showed that there was a difference between 1987 and 2012 weight of labor inputs because in 2012 the shifting of labors was observed as compared to 1987. Rough estimated indication was provided by such comparison of labor productivity in 1987 to 2012 due to shifting of labor hours observed. In 1987, 2007, 2012 each industry shared the hour and for each industry in 1987 labor productivity was observed in Table.1.

Table 1. Industries Included in the Labor Shift Analysis, Shares of Hours, and Output per Hour in 1987

Industries in construction		Shares of hours			
NAICS	Title	1987 (%)	2007 (%)	2012 (%)	O=H
236115	New single-family housing construction (except operative builders)	4.2	4.4	3.1	59
236116	New multiple-family housing construction (except operative builders)	0.8	0.5	0.3	110
236117	New housing operative builders	3.5	3.1	1.7	129
236118	Residential remodelers	5.3	5.5	7.4	45
236210	Industrial building construction	1.8	0.8	1.1	58
236220	Commercial and institutional building construction	9.6	7.0	7.2	96
237110	Water and sewer line and related structures construction	2.5	2.1	2.2	51
237120	Oil and gas pipeline and related structures construction	1.3	2.0	2.9	29
237130	Power and communication line and related structures construction	2.1	2.2	3.3	37
237210	Land subdivision	1.1	1.3	0.4	191
237310	Highway, street, and bridge construction	5.9	4.2	4.3	58
237990	Other heavy and civil engineering construction	2.0	1.0	1.4	52
238110	Poured concrete foundation and structure contractors	2.9	3.9	3.0	35
238120	Structural steel and precast concrete contractors	1.0	1.0	0.9	45
238130	Framing contractors	2.4	2.1	1.2	24
238140	Masonry contractors	3.6	2.9	2.2	26
238150	Glass and glazing contractors	0.9	0.7	0.6	41
238160	Roofing contractors	3.2	2.2	2.4	35
238170	Siding contractors	0.8	0.8	0.7	30
238190	Other foundation, structure, and building exterior contractors	0.4	0.6	0.7	36
238210	Electrical contractors and other wiring installation contractors	9.1	9.8	10.5	36
238220	Plumbing, heating, and air-conditioning contractors	10.6	11.2	12.2	42
238290	Other building equipment contractors	1.5	1.7	1.9	45
238310	Drywall and insulation contractors	3.8	4.1	3.4	39
238320	Painting and wall covering contractors	5.0	4.8	4.7	19
238330	Flooring contractors	1.7	1.7	1.7	28
238340	Tile and terrazzo contractors	0.7	1.4	1.1	32
238350	Finish carpentry contractors	4.4	3.7	3.3	20
238390	Other building finishing contractors	0.6	0.8	0.9	33
238910	Site preparation contractors	4.2	8.1	7.6	38
238990	All other specialty trade contractors	3.2	4.5	5.4	32
23	Construction	100	100	100	50

III. SUB-CONTRACTOR LABOR:

Sub-contractor labors were used in construction industries throughout the world by large number of construction builders to replace their own labor force with carpenters, steel fixer, Masonry worker and plumber etc. In overall construction industries Labor inputs were incorporated by the subcontractor because material input was not potential for him due to huge cost. The paper did not analyze the indirect supply measurement to each of industry by the subcontractor. It was noted that in each type of construction (Single or multistory family buildings) what is the output of sub-contractor in each field from construction censuses. The construction censuses clearly showed each type of construction for new construction, addition, renovations, alteration, and maintenance and repair how much output were delivered. In the residential building, it must be knowing how much labors were provided by the subcontractor. For Repair and maintenance that output delivery relative to new construction the sub-contractor considered the out maintenance three times the labor intensive. Similarly, for addition and alteration contractor consider as compared to new construction twice the labor intensive for output delivery. For every type of contractor these considerations were true and used for long time period. [VII] described output ratios of one, two and three was selected by labors. From above consideration for a particular nature of contractor it was easy to understand the provision of labor by contractor.

We Considered that Contractor labor such as carpenter provide total output to new construction was 60%, maintenance and repair , alteration, and addition 20% and 20% respectively. Relative to ration of labor inputs 1, 2 and 3

$$0.60 \cdot 1x + 0.20 \cdot 2x + 0.20 \cdot 3x = L \quad (2)$$

Where L= Carpenter employed labors input

For determine value of x , solve the equation we find that $X = L/1.60$, It showed that to supply for new construction the total carpenter was $0.60/1.60 L$, while to delivered to new construction the overall carpenters sub-contractor labor was 0.375. In order to know the amount of labor once they can easily allocate in the industries. Once contractor indirectly supply the labors such as carpenters, steel fixers and roofers etc. has been established to single family building then from each source the sum of labor inputs provided determined the total sum of labor inputs. The long productivity was still positive even with expanded definition of Labor input as show in Figure.1

Type of labor	Variable	Constant	Housing starts	Time	Fit and sample size
Direct labor only	Single family	-21.734	0.417	0.0117	$\bar{r}^2 = 0.82$
	t-ratios	-5.26 ^a	8.39 ^a	5.66 ^a	$n = 28$
	Multiple family	-72.538	0.300	0.0379	$\bar{r}^2 = 0.84$
	t-ratios	-10.09 ^a	3.32 ^a	10.65 ^a	$n = 28$
Direct and indirect labor	Single family	-18.915	0.291	0.0107	$\bar{r}^2 = 0.48$
	t-ratios	-2.81 ^a	3.93 ^a	3.18 ^a	$n = 28$
	Multiple family	-27.579	0.198	0.0156	$\bar{r}^2 = 0.43$
	t-ratios	-2.73 ^b	1.75	3.15 ^a	$n = 28$

Fig.1 productivity growth in Housing 1987-2014

It was investigated in this paper that productivity growth rate for single family was 1.1% per year while 1.6% was noted in multifamily construction. More ever it was observed that for industrial construction and highways the long productivity growth was found 2.7% and 0.5% respectively as shown in figure 02 and 03.

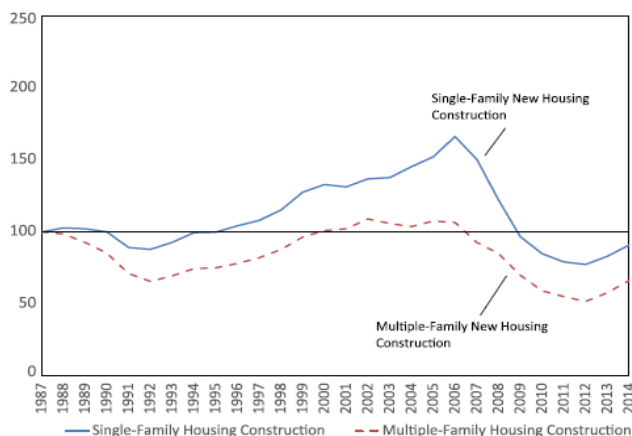


Fig 02. Productivity growth including indirect labors (housing) construction (including indirect labors)

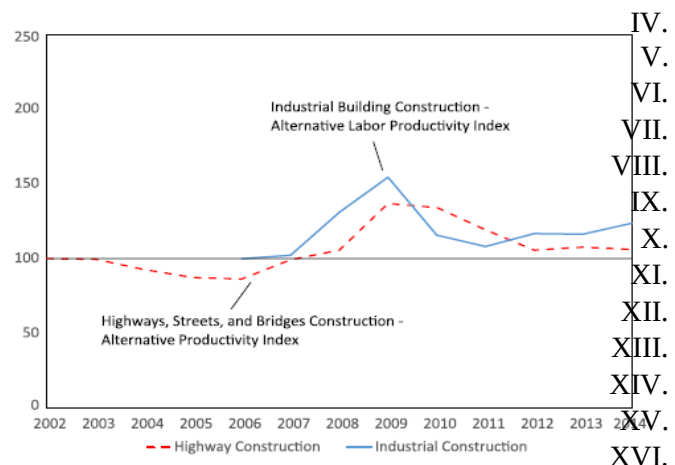


Fig 03 Productivity growth, highways and industrial construction (including indirect labors)

IV. LABOR INPUT OF UNDOCUMENTED IMMIGRANTS:

As compared to other industries undocumented immigrants worked most in construction industry Passel (2006). In order to know the effect on measurement of productivity growth of construction industries due to undocumented immigrants first we started to estimate the absolute numbers of undocumented immigrants and their present population [VIII]. It was also important to find the numbers of undocumented immigrants labor force unauthorized and worked in the construction industry. In 2005 (Passel 2006) noted the number of undocumented labors in construction work which was found as 12% of all workers but 4.9% were present of all workers. In construction work the undocumented labor force implied number was known once than using this data combined together with data from 1987 to 2011 (develop previously) on total number of hours worked in construction. 8.38% per year immigrant's hour increased were suggested by the data, while 0.26% per year native hours increased. 12.8% of small share of overall labor inputs as immigrants as per 2011. This clearly showed that there was no immense influence of Undocumented immigrants on Productivity growth. In total construction the labor force of undocumented immigrants was so small, so they were not influencing the productivity growth too much.

V. STUDY OF FOUR INDUSTRIES PRODUCTIVITY GROWTH:

In the presence of high value deflators and corresponding output measure this review was composed to study four industries for productivity growth. These four industries consisting of industrial, highways, housing with single and multi-family industries. It was important to know that using these deflators no one researched on these four industries previously. Four different resources having four different deflators. From 1987 to 2014 single and multi-family housing were covered through analysis, while in 2006 industrial building and in 2002 highways began. This review paper only examined the labor productivity growth and not to measure capital and materials inputs because it was difficult. For single and multi-family residential construction output trends were shown in figure 04. From figure it was clearly understandable that from 2004 to 2007 the outputs reached at peak and then drop down rapidly. Due to last longer projects the multifamily construction reached little later at its peak. While The growth of labor inputs in each of housing industry information were shown in the fig: 05

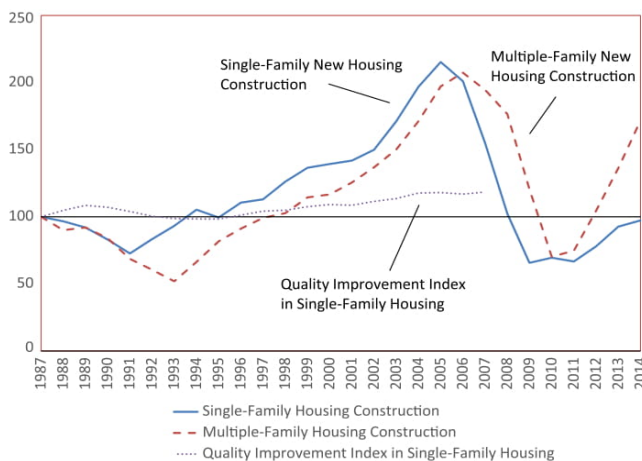


Fig 05. Housing Output

In multifamily housing the output increases from labor inputs as shown in figure 06. More ever productivity growth was rapidly increased multifamily housing and in 2004 to 2007 reached to peak and then declined rapidly and began to recover in 2010. 3.2% per years in highways and 2.3% in industrial construction the Productivity increased using average annual rates of growth over entire period.

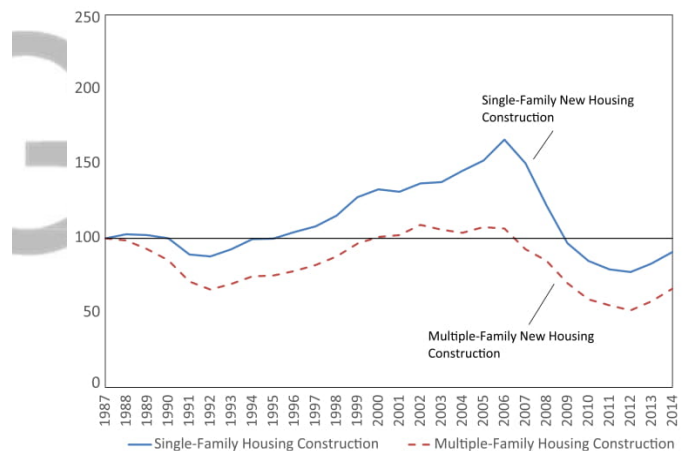


Fig 06: Labor Input in Housing

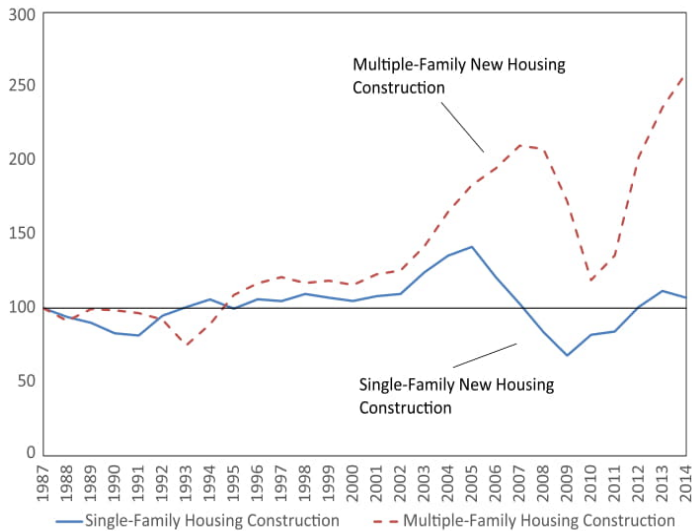


Fig: 07 Labor Productivity growth in Housing

VI. CONCLUSIONS:

From available estimates about productivity growth in construction industry has been reduced from previous half century which was remained the main points for research of tension. More ever also more of the observer accepted actual occurrence that the reduction in productivity growth in construction industry. This paper mainly focusses on construction industries to know the productivity growth. All specified industries productivity growth was clear and substantial. If Labor was included taken from contractor still positive trends occurs. More ever that it was very important to know that in this review industries representing the sub-contractors and other observers in which repair and maintain ace; additions and alteration was essential were excluded. In these other portions of construction, the Productivity growth was very limited. So, in overall construction industry it was early to conclude the productivity growth. The productivity growth was reduced by some additional influence of low productivities. Substantially 0.4% per year productivity growth was reduced due to shifting among labor. Regulation may reduce growth 0.1% per year even after its effect was negative on productivity growth. Approximately 0.1% per year growth of production in construction industries were increased due to overstated of undocumented immigrants. A question was raised that why the productivity rate was too much lowered as compared to rest of economy which could not be explained by combining all the influences. By using the microdata future work will expand the analysis and in more seven industries such as schools, warehouses, offices, and several industries it was possible to know the productivity growth. However, in considerable time period the microdata will be obtained carefully form government agencies.

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