A Sectoral Perspective on the Slowdown of U.S. Employment†

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Abstract

The U.S. labor market has undergone a remarkable change, whereby a substantial increase in the employment to population ratio of 15 percentage points between 1960 and 2000 is followed by a decline since then of more than 4 percentage points. While in this process there has been a substantial decline in manufacturing employment, I show that this trend is dwarfed by the slowdown in employment in services. To study the determinants of these trends in sectoral employment, I develop an otherwise standard model of structural transformation with exogenous sectoral labor productivity growth, that incorporates the changes in the employment ratio over time. I calibrate the model to the process of structural change between 1960-2000 and show that the increase in the employment ratio accounts for 2/3 of the increase in the employment ratio in services during this period. Then I show that both faster productivity growth in manufacturing and the decline in the employment ratio largely account for the decline in the employment ratios in goods and in services after 2000. Moreover, even a flattening of the employment ratio, associated with the convergence of female labor force participation, accounts for the bulk of the slowdown in the employment ratio in services since 2000. A sectoral analysis together with the remarkable changes in labor supply over time, are critical in understanding the changes in sectoral employment in the U.S. economy.

JEL classification: E1, E24, J11, J16, J21, J22, O11, O41, O51.

Keywords: employment, goods, services, productivity, structural transformation, labor force, women.

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1 Introduction

Around 2000 trends in the U.S. labor market changed markedly. Between 2000 and 2018 the overall annual employment to population ratio fell by about 4 percentage points, with a large decline happening before the sharp decline associated with the Great Recession. While the overall employment ratio has been increasing since 2010 it has not yet reached its pre-recession level. This decline, described as a “historic turnaround in U.S. employment trends” (Moffitt, 2012), follows several decades of an upward trend in the overall employment ratio. A large literature has emerged documenting in detail the evidence on U.S. labor market trends and accounting for these trends (Moffitt, 2012; Abraham and Kearney, 2018).

The turn of the century also marks the beginning of a period of sharp contraction in employment in manufacturing. Between 2000 and 2018, the number of manufacturing jobs fell by about 4.5 million, with more than 3 million manufacturing jobs lost between 2000 and 2007. While manufacturing employment had been on a declining trend for a few decades, the magnitude of the contraction that occurred after 2000 is much larger than previous loses. This contraction in manufacturing has been understood as a prime contributor to the slump in overall employment and a large literature has emerged to explain these loses in manufacturing employment. Two factors have received extensive attention in the literature: 1) the role of import competition from China, and 2) the role of computerization and automation. Abraham and Kearney (2018) provide a detailed review of the literature.

In this paper I argue that 2000 also marks the beginning of a large deceleration in the growth of employment in services. In fact, the decline in manufacturing jobs after 2000 is dwarfed by the deceleration in service jobs. Prior to 2000, the upward trend in the employment-to-population ratio is accompanied by a sizeable increase in the service employment ratio and a decline in the manufacturing employment ratio. This sectoral reallocation of employment from manufacturing to services is consistent with the process of structural transformation
that countries undergo as they develop. However, after 2000 service employment relative to population has been about constant, in sharp contrast with the process of sectoral reallocation observed in the U.S. economy until 2000. Therefore, I argue that to adequately interpret the sectoral changes in the U.S. labor market we must take into account the role of structural transformation of economic activity in development.

I build a simple general equilibrium model of structural transformation to study the forces determining the sectoral allocation of employment and its changes over time. I calibrate the model to the period 1960 to 2000 and perform experiments for 2000-2018. Employment reallocation in the model is driven by differences in labor productivity growth across sectors as well as changes in the total employment to population ratio. I show that the calibrated model is broadly consistent with the patterns of structural change during the period and highlight the importance of the evolution of the overall employment ratio for the reallocation of employment to services. In particular, I show that the calibrated model implies that the observed increase in the employment ratio accounts for about 2/3 of the increase in the employment ratio in services. I note that several authors have argued that the observed increase in the employment ratio between 1960 and 2000 is associated with the increase in labor force participation of women. As a result, this analysis highlights the potential role of labor supply in the process of structural transformation.

Next, I use the calibrated model to derive implications for the period since 2000. I show three main results. First, taking as given the same sectoral productivity growth rates as in the period 1960-2000 and the observed employment ratio since 2000, the model implies sectoral employment ratios that are broadly consistent with the data for the period since 2000. In particular, in the model, manufacturing employment continues to decline after 2000, from 11.6 percent in 2000 to 9.1 percent in 2018 versus 8 percent in the data. In turn, the model also implies a somewhat more pronounced slowdown in service employment than what is observed in the data. The employment ratio in services drop from 50.5 percent in
2000 to 48.7 percent in 2018 in the model versus 49.8 in the data. Second, I show that an acceleration of productivity growth in manufacturing can potentially account for the faster decline in the employment ratio in manufacturing observed since 2000. Third, the marked change in the behavior of the employment ratio largely accounts for the patterns of sectoral allocation since 2000. In particular, the decline in the employment ratio since 2000 largely accounts for the decline in the employment ratio in manufacturing and the stagnation of the employment ratio in services. More importantly, relative to the period between 1960 and 2000, the flattening in the employment ratio, perhaps associated with the convergence in labor force participation of women, accounts for the bulk of the slowdown in the employment ratio in services. Overall, these results highlight the importance of labor supply for structural change in the United States in the last six decades.

This paper relates to a large literature documenting U.S. labor market trends after 2000, see Abraham and Kearney (2018) for a comprehensive review. This literature has focused predominantly on employment in the manufacturing sector (see, for instance, Charles et al. (2016), Charles et al. (2018)). One strand of this literature has linked the decline in manufacturing employment to international trade pressures (Autor et al., 2013; Pierce and Schott, 2016). Acemoglu et al. (2016) estimates the role of import competition from China on U.S. manufacturing employment as well as its broader effect on overall U.S. job growth. Another strand of the literature has focused on how changes in technology (computerization and automation) affects employment (see, for instance, Autor et al. (2015) and Acemoglu and Restrepo (2018)). This paper contributes to this literature by documenting changes in service employment and emphasizing their importance in understanding overall employment trends. This paper also relates to a literature that studies the forces behind the structural transformation of the economy with development. See, for instance, Rogerson (2008). In this paper I analyze changes in U.S. employment in the context of a model that is consistent with the process of structural transformation in the United States.
The paper is organized as follows. In the next section, I document a set of facts on sectoral employment changes in the United States since 1960. Section 3 sets up a model of structural transformation to study the forces determining sectoral employment and changes over time. I conclude in Section 4.

2 Facts


Figure 1 plots U.S. manufacturing employment from 1960 to 2019. Manufacturing employment has been declining since around 1980 but the pace of decline accelerated sharply around 2000. Between 1980 and 2000 manufacturing jobs fell by about 1.5 million while from 2000 to 2018 manufacturing jobs fell by about 4.5 million. Note that a large fraction of these job losses occurred in the earlier 2000’s, before the onset of the Great Recession.

Figure 2 puts the evolution of manufacturing employment into the broader context of U.S. employment by plotting employment in both the manufacturing and service sectors over the period. In the broader context of the U.S. labor market, the decline in manufacturing employment after 2000 appears less dramatic. In turn, this figure highlights the sustained increase in service employment over the entire period. Between 1960 and 2000 the U.S. economy added about 72 million jobs in the service sector. After 2000, employment in services continues to grow but at a noticeably slower pace than before.

To characterize these trends in employment more effectively, Table 1 reports changes in

\[ \text{See Appendix A for a description of the data.} \]
total non-farm, manufacturing, and service employment over two decade periods from 1960 to 2018. I also report numbers for the period 2000-2007 in all tables to avoid confusing trends with the effect of the Great Recession. Over the periods 1960-1980 and 1980-2000 non-farm employment grew by more than 35 million jobs. Compared to these two periods, total non-farm employment grew considerably less between 2000-2018, by about half or 17 million jobs. As documented in Figure 1, loses in manufacturing jobs started prior to 2000 but the period after 2000 is characterized by a much sharper decline in manufacturing employment. In contrast, employment in services has grown substantially over the 3 periods reported. However, note that after 2000 employment in services grew substantially less than in the previous two periods, from an average of about an additional 35 million service jobs during 1960-1980 and 1980-2000, to around an additional 21 million service jobs during 2000-2018.
That is, in terms of absolute numbers of jobs, the decline in manufacturing jobs after 2000 is dwarfed by the deceleration in services.

Table 2 reports changes in the employment to population ratios for total non-farm, manufacturing, services as well as an aggregate of the remaining sectors of the economy over the same two-decade periods.\textsuperscript{2} The change in the total non-farm employment ratio is simply the sum of changes in employment ratios for all sectors of the economy and thus the change in a sector’s employment ratio can be interpreted as the sector’s contribution in accounting for the change in the overall employment ratio. For instance, between 1960 and 1980 the total non-farm employment ratio increased by 7.7 percentage points while the manufacturing

\textsuperscript{2}For consistency, I compute employment to population ratios using CES employment data. These numbers differ from employment to population ratios computed using CPS employment data.
Table 1: Changes in U.S. Employment

<table>
<thead>
<tr>
<th></th>
<th>Non-farm</th>
<th>Manufact.</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1980</td>
<td>+36,240</td>
<td>+3,300</td>
<td>+31,150</td>
</tr>
<tr>
<td>1980-2000</td>
<td>+41,500</td>
<td>-1,470</td>
<td>+41,110</td>
</tr>
<tr>
<td>2000-2018</td>
<td>+17,030</td>
<td>-4,580</td>
<td>+20,980</td>
</tr>
<tr>
<td>2000-2007</td>
<td>+5,900</td>
<td>-3,390</td>
<td>+8,390</td>
</tr>
</tbody>
</table>

Employment ratio fell by 2 percentage points. That is, between 1960 and 1980, employment in manufacturing grew less than population and the overall employment to population ratio would have declined by 2 percentage points if employment ratios in all other sectors of the economy had remained constant.

Table 2: Contributions to Changes in the Employment Ratio

<table>
<thead>
<tr>
<th></th>
<th>E/P</th>
<th>Manufact.</th>
<th>Services</th>
<th>Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1980</td>
<td>+7.66</td>
<td>-2.00</td>
<td>+9.56</td>
<td>+0.10</td>
</tr>
<tr>
<td>1980-2000</td>
<td>+8.14</td>
<td>-3.05</td>
<td>+11.01</td>
<td>-0.18</td>
</tr>
<tr>
<td>2000-2018</td>
<td>-4.29</td>
<td>-3.20</td>
<td>-0.72</td>
<td>-0.37</td>
</tr>
<tr>
<td>2000-2007</td>
<td>-2.60</td>
<td>-2.14</td>
<td>-0.59</td>
<td>-0.13</td>
</tr>
</tbody>
</table>

Note that the contribution of changes in the manufacturing employment ratio for changes in the overall non-farm employment ratio is negative for all periods reported in Table 2, between 2 and 3 percentage points. Instead, up to 2000, the employment ratio in services increased by about 10 percentage points in each two-decade period. That is, up to 2000, growth in employment in services is the key contributor for the increase in the overall employment to population ratio between 1960 and 2000. This sectoral characterization up to 2000, whereby employment in services is growing faster than in manufacturing, is consistent with
the process of structural transformation that occurs with development (Duarte and Restuccia, 2010; Herrendorf et al., 2014). After 2000, there is a sharp change, with the contribution from changes in the employment ratio in services falling to about zero. Therefore, I argue that a key issue in understanding changes in the overall employment to population ratio is understanding the slowdown in service employment that occurs after 2000. In addition, in order to correctly interpret these facts we must take into account the role of structural transformation.

Table 3 reports changes in the overall employment to population ratio and the employment to population ratios in services and private services. I conclude that the behavior of employment in services is mostly accounted for by changes in employment in private services, with changes in employment in the government playing a minimal role.

<table>
<thead>
<tr>
<th></th>
<th>E/P</th>
<th>Services</th>
<th>Priv. Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1980</td>
<td>+7.66</td>
<td>+9.56</td>
<td>+7.01</td>
</tr>
<tr>
<td>2000-2018</td>
<td>-4.29</td>
<td>-0.72</td>
<td>+0.35</td>
</tr>
<tr>
<td>2000-2007</td>
<td>-2.60</td>
<td>-0.59</td>
<td>-0.39</td>
</tr>
</tbody>
</table>

In Table 4 I report changes in overall and sectoral employment ratios by gender. CES employment data by gender is available only after 1964 and thus the first period reported in this Table is 1964-1980.

Note that the increases in the overall employment to population ratio up to 2000 are accounted for by mostly increases in the employment to population ratios of women, with minimal contribution from changes in the ratio of men. The decline in the employment ratio observed after 2000 is accompanied by declines for both men and women, with a larger de-
Table 4: Contributions to Changes in Employment Ratios by Gender

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Manufacturing</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>1964-1980</td>
<td>+7.06</td>
<td>-0.55</td>
<td>+7.61</td>
</tr>
<tr>
<td>1980-2000</td>
<td>+8.14</td>
<td>+0.86</td>
<td>+7.28</td>
</tr>
<tr>
<td>2000-2007</td>
<td>-4.29</td>
<td>-3.17</td>
<td>-1.12</td>
</tr>
<tr>
<td>2000-2018</td>
<td>2.60</td>
<td>-1.72</td>
<td>-0.88</td>
</tr>
</tbody>
</table>

cline for men. In manufacturing, the employment ratio of women increased only in the first period reported, 1964-1980. Since 1980 employment ratios in manufacturing have declined for both men and women. In terms of services, note that both the large increases prior to 2000 and the sharp slowdown after 2000 in the employment ratio in services is accounted for mostly by the behavior of employment of women.

To summarize, after 2000 employment in manufacturing declined sharply and growth in employment in services decelerated substantially. These facts imply that the pattern of sectoral reallocation of employment changed dramatically around 2000. In the next section I set up a simple model of sectoral labor allocation to interpret these facts.

3 The Model

I develop a simple general equilibrium model of the structural transformation of an economy, following Rogerson (2008) and Duarte and Restuccia (2010). The model economy comprises two sectors (goods and services) and labor reallocation across sectors is driven by two forces – an income effect due to non-homothetic preferences and a substitution effect due to differential sectoral productivity growth. I calibrate a benchmark economy to U.S. data and show that this basic framework captures the salient features of changes in sectoral labor
allocations.

### 3.1 The Environment

**Production.** Each period two commodities are produced: goods \( g \) and services \( s \) according to the following constant returns to scale production functions:

\[
Y_i = A_i L_i, \quad i \in \{g, s\},
\]

where \( Y_i \) is output in sector \( i \), \( L_i \) is labor input in sector \( i \), and \( A_i \) is a sector-specific technology parameter.\(^3\)

I assume that there is a continuum of homogeneous firms in each sector that are competitive in output and factor markets. At each date, given the price of commodity \( i \), \( p_i \), and wages \( w \), a representative firm in sector \( i \) chooses the labor input to maximize profits.

**Households.** The economy is populated by an infinitely-lived representative household of constant size. The household is endowed with \( L \) units of time each period which are supplied inelastically to the market. The household has preferences over consumption of goods and services as follows:

\[
\sum_{t=0}^{\infty} \beta^t u(c_{g,t}, c_{s,t}), \quad \beta \in (0, 1).
\]

The per-period utility is given by:

\[
u(c_{g,t}, c_{s,t}) = (a (c_{g,t} - \bar{g})^\epsilon + (1 - a) (c_{s,t})^\epsilon)^{\frac{1}{\epsilon}},
\]

where \( \bar{g} > 0 \) is a subsistence consumption level of goods, \( a \in (0, 1) \), and \( \epsilon < 1 \). For \( \bar{g} > 0 \), these preferences imply that the income elasticity of goods is smaller than one. The household

\(^3\)For simplicity I abstract from capital. In this model, differences in labor productivity may also reflect differences due to capital.
chooses consumption allocations to maximize utility subject to the budget constraint

\[ p_{g,t} c_{g,t} + p_{s,t} c_{s,t} = wL, \]

taking prices and the wage rate as given.

\textit{Equilibrium.} This model is a sequence of static labor allocation problems. Market clearing implies that

\[ c_g = A_g L_g, \quad c_s = A_s L_s, \quad L = L_g + L_s. \]

Normalizing the wage rate to 1, the firms’ problem implies that prices are given each period by

\[ p_i = \frac{1}{A_i}, \quad i \in \{g, s\}. \quad (2) \]

The first-order conditions for the household imply that the marginal rate of substitution between goods and services equals their relative price. Combining this condition with market clearing conditions and the firms’ first-order conditions implies that employment in the service sector is given by

\[ L_s = \frac{\chi}{1+\chi} \left( L + \frac{\bar{g}}{A_g} \right), \]

where \( \chi = \left( \frac{a}{1-a} \right)^{\frac{1}{1-a}} \left( \frac{A_g}{A_s} \right)^{\frac{a}{1-a}}. \) This model incorporates two channels that generate sectoral labor reallocation associated with structural transformation: income effects due to non-homothetic preferences and substitution effects due to differential productivity growth across sectors.\(^4\)

\(^4\)For models of structural transformation emphasizing income effects, see, Echevarria (1997) and Kongsamut et al. (2001). For models of structural transformation emphasizing substitution effects, see, Ngai and Pissarides (2007).
3.2 Calibration

I calibrate the benchmark economy to be consistent with the process of structural transformation in the United States between 1960 and 2000. The model is driven by exogenous sectoral productivity growth and changes in the employment ratio. In particular, I assume that productivity grows at an exogenous and constant rate in each sector, that is

\[ A_{i,t+1} = (1 + \gamma_i) A_{i,t}, \quad i \in \{g, s\}. \]

I also assume that the employment ratio \( L_t \) changes in each period according to the data. Note that \( L \) in the model maps to total non-farm employment in the data. In addition, in the data, manufacturing accounts for a large portion of the goods sector.

Table 5: Calibration

<table>
<thead>
<tr>
<th>Parameter ( A_{i,60} )</th>
<th>Value</th>
<th>Target U.S. data</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \gamma_s )</td>
<td>2.48%</td>
<td>Avg. productivity growth in goods</td>
</tr>
<tr>
<td>( \gamma_g )</td>
<td>1.44%</td>
<td>Avg. productivity growth in services</td>
</tr>
<tr>
<td>( L_t )</td>
<td>{data}</td>
<td>Total non-farm employment ratio</td>
</tr>
<tr>
<td>( \bar{g} )</td>
<td>10.6</td>
<td>Share of employment in goods 1960</td>
</tr>
<tr>
<td>( a )</td>
<td>0.016</td>
<td>Share of employment in goods 2000</td>
</tr>
<tr>
<td>( \epsilon )</td>
<td>-1.5</td>
<td>Aggregate productivity growth</td>
</tr>
</tbody>
</table>

Table 5 reports the parameter values used. Sectoral initial productivities are set to unity in 1960 and the average annual sectoral growth rates of labor productivity are taken from Rogerson (2008) and set equal to 2.48 percent and 1.44 percent in the goods and service sector, respectively. The total non-farm employment ratio determines the value of \( L_t \) in each period. The preference parameters \( a \) and \( \bar{g} \) are set so that the model matches the share of employment in the goods sector in 1960 and 2000.
Performance. Figure 3 reports the employment ratios in goods and services implied by the model (solid lines) and in the data (dashed lines). The figure also reports the total non-farm employment ratio. The model, taking as given exogenous and constant labor productivity growth and the overall employment ratio, captures fairly well the sectoral reallocation of labor from goods to services observed in the United States between 1960 and 2000. The calibration is designed to match the changes in employment ratios across sectors between 1960 and 2000, but overall the model does a good job capturing the year-by-year changes in these sectoral ratios.

Role of Driving Forces. Using the calibrated economy, I can disentangle the role of sectoral productivity growth and the role of changes in the employment ratio in accounting for the observed variation in sectoral employment. To accomplish this, I compute the equilibrium of
the model economy assuming a counterfactual constant employment ratio since 1960. Figure 4 reports the employment ratios in goods and services implied by the model when the overall employment ratio remains constant at its 1960-level.

The results are striking. The model implies that the increase in the employment ratio has a substantial effect on the growth of service employment, while at the same time a modest quantitative effect on the reallocation of labor out of the goods sector. The employment ratio in the goods sector declined by 4.8 percentage points in the data, from 16.4 percent in 1960 to 11.6 percent in 2000, while in the model with a constant overall employment ratio, the employment ratio in the goods sector drops to 9.5 percent in 2000, a 6.9 percentage point decline. For services the difference is dramatic; the employment ratio in services increases by 20.5 percentage points in the data, from 30 percent in 1960 to 50.5 percent in 2000, whereas
in the model with a constant employment ratio, the employment ratio in services increases only to 36.8 percent in 2000, a 6.8 percentage point increase. This implies that about 2/3 of the observed increase in the employment ratio in services is due to the increase in the overall employment ratio.

To see why the model implies that increases in the employment ratio affect the service sector disproportionately more than the goods sector, note that

\[
\frac{\partial L_s}{\partial L} = \frac{\chi}{1 + \chi},
\]

where, as before, \( \chi = (\frac{a}{1-a})^{\frac{1}{\epsilon}} \left( \frac{A_g}{A_s} \right)^{\frac{\epsilon}{1+\epsilon}}. \) The magnitude of the sectoral effect of changes in \( L \) depends on the relative weight of goods and services in utility \( (a/(1-a)) \), relative sectoral productivity \( (A_g/A_s) \), and the parameter \( \epsilon \). For \( \epsilon = -1.5 \), the low weight of goods in the utility function implied by the calibration means that the term \( (a/(1-a))^{\frac{1}{\epsilon}} \) is about 5; that is employment in services increases by about 0.83 in response to a marginal increase in \( L \) (when labor productivity is equal across sectors). In addition, note that, as long as \( \epsilon < 0 \), the term \( (A_g/A_s)^{\frac{\epsilon}{1+\epsilon}} \) grows over time since labor productivity tends to grow faster in the goods sector than the service sector. This additional effect further magnifies, over time, the effect of a given increase in \( L \) on service employment relative to goods employment.

The rise in the employment ratio, likely associated with the rise in women’s participation, is key in the context of this model to capture the strong rise in services.\(^5\) This highlights the importance of labor supply changes in the overall process of structural change in the U.S. economy, a feature that is often abstracted from in quantitative models of structural transformation.

\(^5\) Ngai and Petrongolo (2017) study the role of the rise in services in accounting for the evolution of hours and wages by gender between 1970 and 2006.
3.3 Implications since 2000

I now turn to the implications of the model economy for employment changes after 2000. As before, I keep the same constant annual growth rates of sectoral labor productivity $\gamma_g$ and $\gamma_s$ and I take the observed employment ratio in the data as given. Figure 5 reports the employment ratios in goods and services implied by the model. For the period after 2000, the model implications are broadly consistent with the data. In the model, employment in the goods sector continues to decline after 2000, from 11.6 percent in 2000 to 9.1 percent in 2018 versus 8 percent in the data. In turn, the model also implies a somewhat more pronounced slowdown in service employment than what is observed in the data. The employment ratio in services drop from 50.5 percent in 2000 to 48.7 percent in 2018 in the model versus 49.8 in the data.

Faster Productivity Growth in Goods. There is evidence of a marked increase in the growth of manufacturing labor productivity between 2000 and 2007. I now evaluate whether a possible acceleration of productivity growth in the goods sector can account for the remaining one percentage point drop in the employment ratio. I compute the equilibrium of the model with the same assumptions as before but with an increase in goods productivity since 2000 from 2.48 percent to 3.5 percent. Figure 6 reports the results of this counterfactual. The employment ratio in the goods sector drops to 8.4 percent in 2018 and the employment ratio in services rises to 49.4 percent. I conclude that faster productivity growth in goods can potentially contribute to the further decline in the employment ratio in the goods sector as observed in the data.

The Role of the Employment Ratio. The literature has focused on the apparent secular decline in the employment ratio since 2000. Note that the overall employment ratio declines from 62.1 percent in 2000 to 57.8 percent in 2018. I evaluate the importance of this decline in the employment ratio for the slowdown in the employment ratio in services. To accomplish this, I consider the counterfactual scenario in which the overall employment ratio does not
decline after 2000 and instead remains constant at the 2000 level. Figure 7 reports the employment ratios in the model in this counterfactual scenario along with the employment ratios in the data.

The results again are striking. With a constant employment ratio since 2000 the model still implies a reallocation of employment from goods to services. For instance the model would imply an increase in the employment ratio in services from 50.5 percent in 2000 to 52.5 percent in 2018, and a decline from 11.6 percent in 2000 to 9.6 percent in 2018 in the goods sector. These results imply that the complete stagnation in the employment ratio in services and the entire decline in manufacturing are accounted for by the behavior of the overall employment ratio during this period. Similarly, note that just a flattening of
the employment ratio since 2000 is able to account for the bulk of the slowdown in the employment ratio in services in this period compared to the previous decades since 1960. This suggests that the substantial increase in the overall employment ratio since 1960 and flattening out since 2000—a process that may be associated with the convergence in labor force participation of women—accounts for a substantial portion of the marked slowdown in the employment ratio in services documented earlier.\footnote{Fukui et al. (2018) studies the role of the convergence of women’s employment rates towards men’s in accounting for the slowdown in recent business cycle recoveries.}
4 Conclusion

In this paper I document a sharp deceleration in the growth of employment in services that starts around 2000 and which is, in magnitude, much larger than the decline in manufacturing jobs that occurred simultaneously. I also document that 2000 marks a turning point in the sectoral contributions to changes in the overall employment to population ratio. In particular, for several decades prior to 2000, growth in employment in services is the key contributor for the increase in the overall employment ratio while the contribution of changes in manufacturing is negative and small. In contrast, after 2000, the contribution from changes in the employment ratio in services falls to about zero while the contribution from changes in manufacturing remain negative and small as before.
I study the determinants of these trends in sectoral employment in the context of a standard model of structural transformation driven by differences in labor productivity growth across sectors and changes in the total employment to population ratio. I calibrate the model to the period 1960 to 2000 and perform experiments for 2000-2018. The calibrated model implies that the observed increase in the employment ratio between 1960 and 2000 accounts for about 2/3 of the increase in the employment ratio in services.

For the period after 2000, I show that the model implies sectoral employment ratios that are broadly in line with the data and that the marked change in the behavior of the employment ratio largely accounts for the patterns of sectoral reallocation. That is, the decline in the employment ratio since 2000 largely accounts for the decline in the employment ratio in manufacturing and the stagnation of the employment ratio in services.

The analysis in this paper highlights the importance of changes in labor supply in the process of structural transformation in the U.S. economy, a feature that is often abstracted from in the literature of structural change. Moreover, women’s participation in the labor force is a key factor in accounting for changes in the overall employment to population ratio in the United States: the rise in the employment ratio prior to 2000 is likely associated with the rise in women’s participation rate during this time and the slowdown in the employment ratio after 2000 is also likely associated with the convergence in labor force participation of women to that of men.

To what extent are the changes in female participation and employment ratios common across developed and developing countries? And how important are these changes in employment ratios for structural transformation across countries at different levels of development? These are important questions for future research. Also important is an assessment of the fundamental sources of changes in women’s employment ratios and the rise of services. One possibility is that the rise of women’s employment ratios are due to the engines of liberation: the role of technological advances that freed women’s labor from home to market (Green-
Another possibility is that the rise of service employment encouraged women’s participation due to their comparative advantage in services (Ngai and Petrongolo, 2017). I leave this important inquiry for future research.
References


A Data Sources

I use data from the Current Employment Statistics (CES) survey on total and women employees. Data are monthly and seasonally adjusted. Series on total employment are available since January 1939 while series on women employees are available since January 1964. I use the following series: nonfarm, services, private services, and manufacturing.

I use data from the Current Population Survey (CPS) on population levels (total, men, and women). Data cover civilian non-institutional population, 16 years and over. Data are monthly and seasonally adjusted.