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Talent Allocation, Financial Intermediation and Growth: Evidence and Theory

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Talent Allocation, Financial Intermediation and Growth: Evidence and Theory

Preliminary Version

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Abstract

In this paper we study the relationship between intersectoral wage inequality and economic growth. In the empirical part of the paper, we find a negative correlation of relative wages in the financial sector with respect to manufacturing sector with subsequent economic growth in case of the U.S. states from 1977 to 2011. We show that the result is robust to different standard estimation techniques and control variables. A similar while somewhat less robust result applies to the case of relative sector sizes as measured by the labor force. In the theoretical part we aim at constructing a tractable general equilibrium model of financial intermediation, entrepreneurship and growth with an imperfect labor market, that helps to explain the observed empirical regularities.

Keywords: talent, financial sector, economic growth, intersectoral inequality

1 Introduction

Recent research documents a U-shaped pattern for relative wages in the financial sector in the U.S. over the last century (see Philippon and Reshef (2012)). In this paper we want to study why such a relation exists, and what its consequences for the economy, especially for growth, are, both empirically and theoretically. As a contribution to the existing empirical literature this study using sectoral-level data on individual states of the United States from 1977 to 2011 finds a significant negative effect of relative wage and relative employment size of the financial sector on the subsequent economic growth. This is an important empirical regularity, and stands in a sharp contrast to the previous results on financial intermediation suggesting a positive correlation between financial development (as measured by credits and debts) and economic growth (see e.g. Levine (2005) for an extensive literature review). While most of the papers on the finance-growth nexus focus on the impact of the financial frictions on output and the allocation of capital, this paper asserts that financial development has an important impact on the labor market and the allocation of human capital.

Figure 1 shows the evolution of the relative wage in the financial sector with respect to the manufacturing sector on the left axis and the growth rate of real GDP per capita on the right axis in all U.S. states on average (without Washington D.C.) over the time period 1977-2011. It is evident that the relative wage in the financial sector was increasing while the growth rate was decreasing on average during this time period. Figure 2 shows the sectoral employment shares in finance and manufacturing on the left axis and the total employment on the right axis in the U.S. states (without Washington D.C.) for the same time period. It is evident that the employment share of the manufacturing sector was decreasing over time whereas the employment share of the financial sector was roughly constant. But since the absolute number of employees is increasing, it is clear that the employment size in the financial sector was growing faster than in the manufacturing.

The found negative correlation between relative wage in the financial sector and the subsequent economic growth is very robust to different estimation methods, model specifications, and control variables. In fact, we demonstrate that when controlling for relative wages, standard inequality measures (e.g. Gini) are not significant anymore. Within the study it was further hypothesized that the central driving factor behind the observed negative correlations was the fact that, by paying relatively higher wages, the financial sector reallocates talented employees from the manufacturing sector in a macro-economically inefficient manner. The hypothesis was

shown by sufficient empirical evidence. This finding is in line with notably increasing recent research on the effects of financial sector development on economic outcomes.

The pioneers in the study of the allocation of talent and its implication for growth are Murphy, Shleifer, and Vishny (1991), where the authors develop the model of the allocation of talent between two sectors: productive and rent-seeking. They argue: “the allocation of talent has significant effects on the growth rate of an economy. ... The flow of some of the most talented people in the United States today into law and financial services might then be one of the sources of our low productivity growth. When rent-seeking sectors offer the ablest people higher returns than productive sectors offer, income and growth can be much lower than possible” (Murphy et al., 1991, p. 506). The evidence shows that countries with a higher proportion of engineering college enrollment grow faster, whereas countries with a higher proportion of law college enrollment grow more slowly.

Philippon and Reshef (2012) find that financial industry is a high-skill and high-wage industry relative to the rest of the private sector in the periods before financial regulations were introduced and after these regulations were removed. During the period of Depression-era 1930s-1980 wages and skill intensity are similar in finance and the rest of the economy. This link holds for finance as a whole, as well as for subsectors within finance. By 2006 the skill-premium for financial workers reaches 50% and for CEOs in finance 250%.

Kneer (2012) finds that financial deregulation disproportionately reduces labor productivity in more high-skill intensive industries. On the other hand, the real sector benefits from financial deregulation through improved intermediation services. She uses results of Philippon and Reshef that financial deregulation associated with increased employment of skilled labor in financial sector to find support to the hypothesis that the financial sector absorbs talent at the cost of productivity in the non-financial industries. The overall effect of reallocation of talent on the labor productivity in real sectors depends on the combination of a sector’s reliance on skilled labor and external funds.

Philippon (2011) finds that the cost of financial intermediation, measured as the sum of all profits and wages paid to financial intermediaries, divided by the GDP increases on average from 1870 to 2010. The measure of production of financial intermediation is the aggregate of all types of non-financial credit, stock issuance, and liquidity services from deposits and money market funds. The model suggests that the US financial system has become less efficient over time, i.e. the cost of intermediation per dollar of assets created has increased over the past 130

years.

Capelle-Blancard and Labonne (2011) using data for 24 OECD countries over 1970-2008 and GMM estimation methods study the relationship between economic growth and deepening of the financial sector based on its inputs (rather than its outputs) e.g. relative employment in the financial sector. Results confirm that there is no clear and positive relationship between financial deepening and growth.

Gruendler and Weitzel (2013) using data from 188 countries between 1960 and 2010, applying 3SLS and GMM estimation methods, and empirical specification of growth model referring to Barro (2000, 2003, 2013), find that financial system exert positive effect in developing economies, whereas the effect vanishes or becomes even negative in advanced economies. They use financial depth (overall liquid liabilities of the financial system divided by GDP) and the ratio of claims on the private sector to GDP as proxies of the financial system.

Law and Singh (2014) using data on 87 countries and a (innovative) dynamic panel threshold technique, find that there is a threshold effect in the finance-growth nexus. The level of financial development is beneficial to growth only up to a certain threshold, beyond which further development of finance tends to adversely affect growth. Determining an “optimal” level of financial development is more crucial in facilitating growth. The using financial development indicators are private sector credit, liquid liabilities and domestic credit as a percentage of GDP.

King and Levine (1993) construct an endogenous growth model in which financial systems evaluate prospective entrepreneurs and choose the most promising projects. Similar to our theoretical model a more-developed financial system improve the probability of successful innovation. The main difference is that in our model we relax the assumption of the same wage across the sectors, which results in different predictions of the models. Whereas better financial systems in the model of King and Levine always accelerate economic growth, our model generate the inverse U-shape effect of financial development on productivity growth.

Acemoglu (1995) develops an equilibrium model of allocation of talent between two activities: productive entrepreneurship and unproductive rent-seeking. Rent seeking creates a negative externality on productive agents and implies that relative rewards are endogenously determined. More rent-seeking in the society reduces the return both to entrepreneurship and rent-seeking. If the relative return to entrepreneurship falls faster, a multiple equilibria of allocations may arise. Since each equilibrium has different relative rewards, the equilibrium reward structure and allocation of talent are jointly determined.

Bolton, Santos, and Scheinkman (2011) develop the model of occupational choice between a real sector and a financial sector, which is segmented into two types of markets, i.e. organized, transparent markets and informal, opaque markets (OTC). The talented employees in the financial industry are better able to determine the value of assets for sale and can cream-skin the most valuable assets. The excessively high informational rents obtained by informed dealers (talents) in the OTC markets tend to attract too much talent to the financial industry.

Axelson and Bond (2011) develop the dynamic equilibrium model of overpay based on the single friction of moral hazard. Some workers are overpaid relative to the other workers with identical skills, even when firms employ fully optimal dynamic contracts. Overpay for worker depends on labor force condition at the time of entering the labor market, and this has life-long effects on a worker's career because of dynamic segregation. The model predicts that workers who enter the labor force in bad economic times are less likely to get an overpaid job, and that they work harder, implying countercyclical productivity. The model generates talent misallocation: overpaying jobs like investment banking attract talented workers whose skills might be socially more valuable elsewhere.

Shakhnov (2014) build a model in which talented agents by becoming bankers in financial intermediation efficiently match investors with entrepreneurs, but they do not internalize the negative effect on the pool of talented entrepreneurs. As a result the financial sector is inefficiently large in equilibrium.

The paper is organized as follows. Section 2 describes the data set to be used and performs the empirical analysis of the relationship between intersectoral wage inequality and economic growth. Furthermore, we also perform the robustness and sensitivity tests of the obtained results. Section 3 performs a static version of the two-sector model. The last section discusses the major findings of the paper, concludes, and motivates further research.

2 Empirical Evidence

2.1 Data and Variables

Our main data are from the Country Business Patterns (CBP) provided by the U.S. Census Bureau. The CBP provides substantial economic statistics on U.S. business establishments at the state and industry levels. The data is arranged by the Standard Industrial Classification

(SIC) System from 1977 to 1997 and North American Industry Classification System (NAICS) from 1998 to 2011, and aggregated both at the Division level (4-digit codes) and at the Major Group level (6-digit codes), which hereinafter we call sectors and subsectors respectively. Information is available on the number of establishments, employment, and annual payroll. For our purposes we generate the following variables:

Annual Payroll $_{s,t,i}$, *Number of Employees* $_{s,t,i}$, *Number of Establishments* $_{s,t,i}$

$$\text{Average Wage}_{s,t,i} = \frac{\text{Annual Payroll}_{s,t,i}}{\text{Number of Employees}_{s,t,i}}$$

where s stands for state, t for year, and i for sector.

The data on Gross Domestic Product, Population Size, Government Consumption by state and Price Indexes at the national level are from the Regional Economic Accounts provided by the U.S. Bureau of Economic Analysis (BEA). We then calculate the growth rate of real GDP per capita and government share, which is the ratio of government consumption with respect to the real GDP, for each state in each year. As the Price Indexes we use the GDP Deflator to deflate GDP per capita, and the Consumer Price Index (CPI) from the BEA to deflate Average Wage with a base year 2005.

To control for the size of the states, in addition to real GDP per capita and Government Share we generate the next two control variables:

$$\text{Total Number of Employees}_{s,t} = \sum_{i=1}^n \text{Number of Employees}_{s,t,i}$$

$$\text{Total Number of Establishments}_{s,t} = \sum_{i=1}^n \text{Number of Establishments}_{s,t,i}$$

We then select a sample of sectors and subsectors for which we have consistent data for both Annual Payroll and Number of Employees for the same time period. For this reason, we impose a set of the following sample restrictions. We first exclude observations for which there is clear evidence of measurement error. In particular, we exclude observations with negative Annual Payroll, and negative or zero Number of Employees. Further, we exclude observations with Average Wage less than 10th percentile and greater than 90th percentile of the Average Wage distribution across subsectors in each state in each year.

We use Gini coefficient as our measure of intersectoral inequality. We have calculated Gini coefficients using the distribution of the variable Average Wage at the subsectoral level for each state in each year. Figure 3 shows the evolution of the Gini coefficients for eight U.S. states over the time period from 1977 to 2011. There are significant differences between the states: for example Florida has always lower Gini coefficient than Alabama. The figure also shows, that there is an evidence that the level of intersectoral inequality measured by the Gini coefficients has risen on average over time in all states, and there is increasing dispersion of intersectoral inequality between the states after the end of the 90's. Figure 4 shows the time series of the growth rates of real GDP per capita for the same states. The growth rates are in clear harmony with each other, which suggest that the business cycles of these states are quite synchronous. The national recessions in 1980-1982, 1990-1991 and 2007-2009 are also remarkable on the graph.

2.2 Model Specification and Estimation Methods

Constructing the panel data set for fifty U.S. states for the time period 1977-2011, we investigate the following research question: which impact has a change in the intersectoral wage inequality within a given state on a subsequent economic growth within that state? The growth model to be tested takes the following specification:

$$Growth_{s,t} = \beta_1 Growth_{s,t-1} + \beta_2 Gini_{s,t-1} + \beta_3' CV_{s,t-1} + \beta_4 t + u_s + \epsilon_{s,t}, \quad (1)$$

where $CV_{s,t-1}$ is a vector of control variables and u_s is unobserved, time invariant state specific effect.

The empirical results and their interpretation strongly depend on the econometric methods used for estimation. Therefore the choice of an appropriate estimation technique is essential to each research question. In this study investigating the empirical relationship between intersectoral wage inequality and economic growth we use dynamic estimation techniques to analyze the panel data. There are two methods commonly used for analyzing panel data: Fixed Effects estimation (FE) and Random Effects estimation (RE). The key distinction between the FE and the RE estimations is that a RE estimator assumes that an unobserved, time constant, state specific effect is uncorrelated with all the explanatory variables in all time periods. This is a quite strong assumption and to verify this, there is a formal test called Hausman test, which specifies whether there are statistically significant differences between the FE and the RE es-

timates (Wooldridge, 2009, pp. 481-505). The Hausman test was applied to each regression in this study and in all cases it has rejected the RE estimation in favor of the FE estimation suggesting the presence of state specific effects, which supports the regression model stated above. Therefore, only the results of the fixed effects estimation will be performed. Moreover the estimation was carried out using robust standard errors to control for the presence of heteroskedasticity in error terms.

The first problem, which can arise from estimating the equation (1) by the FE, is endogeneity, since it contains a lagged value of independent variable and therefore can lead to inconsistent and biased fixed effects estimator (Forbes, 2000, p. 876; Wooldridge, 2009, p. 503). To correct for this bias the Generalized Method of Moments (GMM) of Arellano-Bond dynamic panel technique, which uses lagged values of each variable as instruments, and hence allows for some endogeneity in the regressions, is applied to each regression. The same principle was used by Hefti (2006) and Forbes (2000).

The second problem is that both estimation methods, the FE and the GMM, have a strong assumption, which implies that the idiosyncratic errors are serially uncorrelated (Forbes, 2000, p. 876; Wooldridge, 2009, p. 504). As we have seen in Figure 4 there are short-run fluctuations in yearly growth rate of real GDP per capita. In order to eliminate large variation in the data we average all variables over four-year and five-year periods. This provides several advantages: first it reduces serial correlation from the business cycles (Forbes, 2000, p. 873); second more relevant economic policy issue of medium-run response of economic growth to a change in the intersectoral wage inequality will be examined. Further, the Time variable, which indicates each period, is included into the regressions to control for a linear time trend. Also, the formal test for the second-order serial correlation was applied to each regression by the GMM estimation method, and the null hypothesis of no autocorrelation could not be rejected at least at the 10% level.

The third problem in (1) is an implied linear trend in the growth process. Therefore, the State and Time Fixed Effects (TFE) method, which is the FE that includes time dummies for each time period, and hence allows for state and time specific effects, is applied to each of the regressions. Furthermore, for an additional robustness analysis the following estimation methods are implemented to each regression model: State Fixed Effects with a state-specific linear trend (FE+ST), which is the OLS with the state dummies and a time trend interacted with the state dummies, and State and Time Fixed Effects with a state-specific linear trend (TFE+ST), which is the OLS with the state and time dummies, and a time trend interacted

with the state dummies. To summarize, in the next sections estimation results of the GMM, FE, TFE, FE+ST and TFE+ST with four-year periods will be performed. The estimation results with the data averaged over the five-year periods are similar to those with the four-year averages, and provide an additional robustness test for our findings, i.e. the estimation results do not depend on the arbitrary chosen time period. These results are available under request.

2.3 Estimation Results

2.3.1 Intersectoral Inequality and Growth

The estimation results of the model (1) are presented in Table 1. The estimated coefficients on the control variables in most cases have expected signs and are statistically significant. The coefficient on the lagged value of Growth rate suggests that the stochastic process is oscillating, but mean-reverting, i.e. the stability condition $|\beta_1| < 1$ is satisfied. There is an upward time trend in the growth process. Growth rate depends negatively on the initial level of real GDP per capita, which supports the conditional convergence in the U.S. states. For a given value of GDP, growth is positively related to the Government Share, which includes government consumption expenditures for civilian, military, and state and local sector, but the estimates are never significant (not shown in the table). Growth is positively related to the number of employees and negatively related to the number of establishments in the previous period. Quite possibly, the latter result suggests the inefficiency of fix costs replication. The same result was obtained by Hefti (2006) for Switzerland. The within R-square in the FE estimation can be interpreted as the amount of time variation in the growth rate that is explained by the time variation in the explanatory variables (Wooldridge, 2009, p. 484). The lost in the number of observations is due to lagged variables in the FE estimation, and lagged and instrumental variables in the GMM estimation. The estimated coefficients on the Gini coefficient are negative and statistically significant at the 1% level by the GMM (column 1), the FE (column 2) and the FE+ST (column 4) estimation methods, whereas the TFE and TFE+ST (columns 3 and 6) estimates of the Gini coefficient are not significant. The FE estimation results suggest that, if intersectoral inequality in Average Wage as measured by the Gini coefficient would have increased by 10 percentage points given all other variables remain the same, the real GDP per capita had grown on average by 3.1 percentage point slower in the next period.

To summarize this paragraph, intersectoral inequality, as measured by the distribution of wages across economic sectors, correlates negatively with the subsequent growth rate of real

GDP per capita within a state across time. When the TFE is applied to the regression, which controls for the time fixed effects of a state, the negative effect of the Gini coefficient becomes insignificant.

2.3.2 Talent Misallocation Hypothesis

Within the study it is further hypothesized that the central driving factor behind the observed negative correlations was the fact that, by paying relatively high wages, the financial sector reallocates talented employees from the manufacturing sector to the financial sector in a macroeconomically inefficient manner. In this paragraph we try to find empirical evidence for the stated hypothesis. For this purpose, we use the data set at the sectoral level and filter out the observations on Manufacturing Division and Finance, Insurance, and Real Estate Division, which hereinafter we call manufacturing and financial sector respectively.

Figure 5 shows the dispersion of average wages in financial and manufacturing sectors for four U.S. states over 1977-2011. It is obvious from the graph that the growth rate of real average wage in the financial sector was on average higher than in manufacturing. The growth rate of real GDP per capita in these states is measured on the right axes of the graphs. We will show that there is a strong correlation between the relative wages and the growth rates in the U.S. states.

We generate the following new variables:

$$Relative\ Wage_{s,t} = \frac{Average\ Wage_{s,t,f}}{Average\ Wage_{s,t,m}}$$

$$Relative\ Employment_{s,t} = \frac{Number\ of\ Employees_{s,t,f}}{Number\ of\ Employees_{s,t,m}}$$

where f and m stand for the financial and manufacturing sectors respectively.

We average the new variables over four- and five-year periods as well, and add it to the previous regression model. Table 2 reports the estimation results. The estimated coefficients on the control variables do not substantially change from Table 1. The negative estimates of the Gini coefficient are still significant by the GMM and the FE estimation, and not significant by the other estimation methods. Whereas the estimated coefficient on the interesting variable Relative Wage in the financial sector is negative and statistically significant at least at the 5% level in every specification. The result of the FE+ST estimation suggests that a ceteris paribus

increase in the Relative Wage by 10 percentage points would have resulted in a 0.9 percentage point lower growth rate in the next period (see column 4 of Table 2).

Thus, the negative effect of the intersectoral inequality as measured by the Gini coefficient seems not to be robust to the changes in the model specification. Therefore we omit it in the next regressions and estimate the following model:

$$Growth_{s,t} = \beta_1 Growth_{s,t-1} + \beta_2 Relative\ Wage_{s,t-1} + \beta_3' CV_{s,t-1} + \beta_4 t + u_s + \epsilon_{s,t}, \quad (2)$$

where $CV_{s,t-1}$ is a vector of control variables and u_s is unobserved, time invariant state specific effect.

Table 3a performs the estimation results. The estimated coefficient on the Relative Wage is negative and highly statistically significant. This is very robust to each estimation method and to the length of the time period (i.e. 4- or 5-year).

Table 3b shows the estimation results of the same model specification, but with the variable Relative Wage calculated using Average Wage in the Central Bank subsector only. The negative effect of the Relative Wage weakens compared to the previous table and becomes less significant. Differently Table 3c shows the estimation results with the variable Relative Wage using Average Wage in the Real Estate subsector only. The negative effect of the Relative Wage on the growth rate doubles compared to the previous results and is highly statistically significant in every column. That is, a 10 percentage point increase in the Relative Wage in the Real Estate sector results in a 1.4 percentage point lower growth rate in the next period by the FE+ST estimation (see columns 4 of Table 3c).

Next we want to examine whether the results do not change if we control for the relative size of the sectors, i.e. we add the variable Relative Employment to the regression. The estimation results are performed in Table 4. The estimates of the Relative Wage are still negative and statistically significant. The estimated coefficients on the Relative Employment are negative as well and statistically significant in all specifications except for the TFE column.

Reverse Causality

So far, the effect of intersectoral wage inequality on the subsequent growth rate was estimated. However, since any estimation method yields the correlation between interesting variables, which does not imply causality, the results should be interpreted cautiously. The estimated causal effect may be distorted by reverse causation leading to simultaneity bias (Persson and Tabellini, 1994, pp. 608-609). Therefore, to ensure the previous results it is necessary to look at the reverse direction of causation, i.e. which effect a change in the growth rate has on a change in the level of intersectoral wage inequality. The following model should be estimated:

$$Relative\ Wage_{s,t} = \beta_1 Relative\ Wage_{s,t-1} + \beta_2 Growth_{s,t-1} + \beta_3' CV_{s,t-1} + \beta_4 t + u_s + \epsilon_{s,t}, \quad (3)$$

Table 5 reports the estimated coefficients on the lagged value of the growth rate in the regressions of the Relative Wage in the financial sector. The results suggest that there is no systematic relation between intersectoral wage inequality and growth, quite the contrary a higher growth rate predicts higher Relative Wage in the next period, which is significant only by the GMM estimation. Hence, the negative effect of the Relative Wage in the financial sector on growth holds only in one direction.

To summarize, the estimated negative coefficient on the relative wage in the financial sector is very robust to every estimation method, to each model specification, to the length of the time period (i.e. 4- or 5-year) and to the reverse causality, and thereby, it is a central finding of this study. In other words, analyzing the data at the sectoral level on the U.S. states for the time period 1977-2011, there is an empirical evidence for the hypothesis, that relative high wages in the financial sector, attracting talented employees from other sectors or even if newcomers, might have negative impact on economic growth.

3 Theory: A Two-Sector Model

We are currently constructing a tractable general equilibrium model of entrepreneurs, financial intermediation and growth. There are two sectors, manufacturing and finance. A person can work in manufacturing, finance or become an entrepreneur (an innovator). A fraction of the

population is endowed with talent, where a talented individual can successfully manage an innovation project, if she receives funding from the financial sector. The financial sector requires resources (labor) to scan the economy for successful projects (entrepreneurs). In the manufacturing sector the stock of current ideas is processed into a final homogeneous good (GDP) using labor. Both sectors are competitive within (labor is paid its marginal product), but - as strongly suggested by the evidence - there is only limited competition between the sectors, such that the law of one price does not apply. We can show that such a model may predict key empirical facts, such as increasing relative wages, increasing relative sector shares and decreasing growth - the source of inefficiency being that, by competition between financial intermediaries, the financial sector itself fails to sufficiently account for an absorption-of-labor effect. Our current model suggests both the likelihood of inventing a new set of blueprints (which might become more difficult over time) and the rewards of a block-buster idea (which might increase over time) to be important determinants of relative wages, labor allocation and ultimately economic growth. These channels are different from previous arguments concerning labor misallocation, such as rent-seeking or cream-skimming.

3.1 Static Model

There are two sectors: manufacturing and financial sector. One can choose to become a worker in the manufacturing or in the financial sector, or become an entrepreneur. The labor constraint:

$$L_f + L_m + e = L$$

For successful innovation, which contributes to the technological level, one need to have a talent. The agents do not know who is endowed with a talent, and there is a random distribution of talents in this economy. But some of them, who believes that she has a talent, can apply her innovation project for the external financing.

3.2 Manufacturing

Output

The final output is produced by the manufacturing sector using DRS technology:

$$Y = AL_m^\alpha$$

where $\alpha \in (0, 1)$. Below we will specify some conditions for α .

The manufacturing sector solves:

$$\max \Pi^m = AL_m^\alpha - w_m L_m$$

$$FOC \Rightarrow w_m = \alpha AL_m^{\alpha-1}$$

Technological level

An aggregate technological level (knowledge, blueprints):

$$A = \int_0^e a(i) di$$

where e is a measure of innovators. We assume $a(i) \in \{0, q\}$, i.e. a successful innovator contributes with a knowledge variety worth q . Let \hat{e} be the measure of successful innovators. Hence,

$$A = \hat{e}q$$

Innovation value

The output net of labor costs:

$$\tilde{Y} = Y - w_m L_m = (1 - \alpha)AL_m^\alpha$$

The successful innovators own a fraction $\gamma \in (0, 1]$ of \tilde{Y} . The value of a successful innovation:

$$V = \frac{\gamma \tilde{Y}}{\hat{e}} = \gamma(1 - \alpha)qL_m^\alpha$$

Thus, knowledge spillovers and rent sharing cancel (tractability).

3.3 Financial intermediation

The prime role of the financial sector is an intermediation. It provides the potential innovators with resources (external finance). Let a measure T of talents are located in the manufacturing sector. The financial sector screens the potential innovators for talents. We assume that talent matters only for innovation in the manufacturing sector, and if a talent chooses to be a worker in the financial sector, she can not become an innovator.

Talent screening

Let $T < L - L_f$ and $P(X = T) = \frac{T}{L - L_f}$ be the fraction of talents in the non-financial sector.

Further, let $P(\hat{X} = T|X = T)$ be the probability to find a talent. Then, $P(\hat{X} = T|X = \neg T)$ is a type I error.

The probability to award a project:

$$P(\hat{X} = T) = P(\hat{X} = T|X = T) \cdot P(X = T) + P(\hat{X} = T|X = \neg T) \cdot P(X = \neg T)$$

The number of awarded projects:

$$P(\hat{X} = T) \cdot (L - L_f)$$

where $P(\hat{X} = T|X = T) \cdot P(X = T)$ is the fraction of good projects, and $P(\hat{X} = T|X = \neg T) \cdot P(X = \neg T)$ is the fraction of bad projects.

Now let $p(s) \equiv P(\hat{X} = T|X = T, s)$ denote the probability to find a talent using screening technology s with $s \in [0, \bar{s}]$. And let $\tilde{p}(s) \equiv P(\hat{X} = T|X = \neg T, s)$ denote a type I error of the screening technology.

Then, the probability to award a project using screening technology is:

$$P(\hat{X} = T|s) = p(s) \cdot P(X = T) + \tilde{p}(s) \cdot P(X = \neg T)$$

It must hold that with $s = 0$ the probability to find a talent is just equal to the fraction of talents, whereas $s = \bar{s}$ means perfect screening, i.e. :

$$p(0) = P(\hat{X} = T|X = T, 0) = P(X = T)$$

$$p(\bar{s}) = P(\hat{X} = T|X = T, \bar{s}) = 1$$

Then, in a linear case we should have:

$$p(s) = P(X = T) + \frac{s}{\bar{s}}(1 - P(X = T))$$

Hence, the fraction of good awarded projects is:

$$p(s) \cdot P(X = T) = P(X = T)^2 + \frac{s}{\bar{s}}(1 - P(X = T))P(X = T)$$

Next, for a type I error it must hold:

$$\tilde{p}(0) = P(\hat{X} = T|X = -T, 0) = P(X = T)$$

$$\tilde{p}(\bar{s}) = P(\hat{X} = T|X = -T, \bar{s}) = 0$$

Then, in a linear case we should have

$$\tilde{p}(s) = P(X = T)(1 - \frac{s}{\bar{s}})$$

Hence, the fraction of bad awarded projects is:

$$\tilde{p}(s) \cdot P(X = -T) = P(X = T)(1 - P(X = T))(1 - \frac{s}{\bar{s}})$$

Summing up yields:

$$P(\hat{X} = T|s) = P(X = T)^2 + (1 - P(X = T))P(X = T) = P(X = T)$$

$$\implies P(\hat{X} = T|s) \cdot (L - L_f) = P(X = T) \cdot (L - L_f) = T \quad \forall s$$

Thus, the number of awarded projects does not depend on the choice of the screening technology. The screening technology can only reduce the type I error and hence, increase efficiency of the

financial sector.

Profit function

Let denote $\tau = P(X = T)$ and $p(s) = (\tau + \frac{s}{\bar{s}}(1 - \tau))$. Then $e = T$ and $\hat{e} = p(s)T$.

An innovation is time intensive. The financial sector covers (opportunity) costs but owns an innovation (binding contract; no moral hazard). The financial sector chooses the screening intensity $s = L_f$ with $\bar{s} = L$ to maximize its profits:

$$\max \Pi^f = p(s)TV - w_f L_f - w_e T = (\tau + \frac{L_f}{L}(1 - \tau))TV - w_f L_f - w_e T$$

where TV is the expected market potential, which the financial sector takes as given. In particular the financial sector ignores changes in TV due to the own recruitment of workforce (talent-taker; indirect externality). From the optimality condition the wage in the financial sector can be written as follows:

$$w_f = (1 - \tau)\frac{T}{L}V$$

Since profits can not be negative, we imply the following restriction on the entrepreneur's wage:

$$w_e \leq \tau V$$

3.4 Labor markets and wages

Assuming perfect labor markets implies the following indifference condition:

$$\tau w_e + (1 - \tau)w_m = w_f$$

Using the results from above the wages in the manufacturing and financial sectors can be rewritten as follows:

$$w_m = \alpha q \tau (L - L_f) (\tau L + (1 - \tau) L_f) L_m^{\alpha-1} L^{-1}$$

$$w_f = (1 - \alpha) q \tau (1 - \tau) (L - L_f) L_m^\alpha L^{-1}$$

Then the indifference condition implies for the wage paid to an innovator:

$$w_e = q(1 - \tau)(L - L_f)L_m^\alpha \left(\frac{1 - \alpha}{L} - \frac{\alpha(\tau L + (1 - \tau)L_f)}{L_m L} \right)$$

$$\begin{aligned}
&= \frac{qL_m}{L_m^{1-\alpha}L} (L_m - \alpha(L_m + L_f + \tau(L - L_f))) \\
&= q(L_m - \alpha L)L_m^\alpha L^{-1}
\end{aligned}$$

Since the wage can not be negative the following condition for α should be fulfilled:

$$w_e \geq 0 \iff \alpha \leq \frac{L_m}{L}$$

The non-negative profit condition in the financial sector implies:

$$\begin{aligned}
&w_e \leq \tau V \\
\iff &q(L_m - \alpha L)L_m^\alpha L^{-1} \leq \tau(1 - \alpha)qL_m^\alpha \\
\iff &\alpha \geq \frac{L_m - \tau L}{L - \tau L}
\end{aligned}$$

Indeed computing the profits in the financial sector yields:

$$\begin{aligned}
\Pi^f &= (\tau + (1 - \tau)\frac{L_f}{L})\tau(L - L_f)(1 - \alpha)qL_m^\alpha \\
&\quad - (1 - \alpha)q\tau(1 - \tau)(L - L_f)L_m^\alpha L^{-1}L_f \\
&\quad - q(1 - \tau)(L - L_f)(L_m - \alpha L)L_m^{1-\alpha}L^{-1}\tau(L - L_f) \\
&= q\tau(L - L_f)L_m^\alpha L^{-1}(\alpha(L - \tau L) - (L_m - \tau L))
\end{aligned}$$

Hence, in equilibrium the zero-profit condition in the financial sector, i.e. $\Pi^f = 0$, implies $\alpha = \frac{L_m - \tau L}{L - \tau L}$, which is strictly smaller than $\frac{L_m}{L}$ for $\tau > 0$.

Now we can compute the relative wage in the financial sector w.r.t. manufacturing sector:

$$\frac{w_f}{w_m} = \frac{(1 - \alpha)(1 - \tau)L_m}{\alpha(L - L_m)} > 1$$

Thus, in equilibrium the wage in the financial sector is strictly greater than the wage in manufacturing sector, and it depends negatively on τ . That is, if talent in manufacturing becomes scarce, i.e. τ decreases, $\frac{w_f}{w_m}$ increases attracting even more talent into the financial sector.

3.5 Resource constraint

The resource constraint of this economy can be written as follows:

$$w_e e + w_f L_f + w_m L_m + \Pi^f \leq Y$$

Applying the zero-profit condition, and hence $w_e = \tau V$ in equilibrium, gives us the following result:

$$\begin{aligned} &\Leftrightarrow w_e e + w_f L_f \leq \tilde{Y} \\ &\Leftrightarrow \tau VT + (1 - \tau) \frac{T}{L} V L_f \leq (1 - \alpha) A L_m^\alpha \\ &\Leftrightarrow (\tau + (1 - \tau) \frac{L_f}{L}) T V \leq (1 - \alpha) q (\tau + (1 - \tau) \frac{L_f}{L}) T L_m^\alpha \\ &\Leftrightarrow \gamma (1 - \alpha) q L_m^\alpha \leq (1 - \alpha) q L_m^\alpha \\ &\Leftrightarrow \gamma \leq 1 \end{aligned}$$

The resource constraint holds with equality in equilibrium if and only if $\gamma = 1$, i.e. there is no waste of resources and the successful innovations owns the whole net output.

3.6 Equilibrium

This is a supply-side equilibrium.

Parameters: $\alpha, \tau, q, L, \gamma = 1$.

Variables: $L_f, L_m, w_e, w_f, w_m, \Pi_f, V, A, Y$.

The equilibrium equations:

$$w_m = \alpha q \tau (L - L_f) (\tau L + (1 - \tau) L_f) L_m^{\alpha-1} L^{-1} \quad (M)$$

$$w_f = (1 - \alpha) q \tau (1 - \tau) (L - L_f) L_m^\alpha L^{-1} \quad (FS)$$

$$\tau w_e + (1 - \tau) w_m = w_f \quad (\text{Indifference})$$

$$\Pi_f = q \tau (L - L_f) L_m^\alpha L^{-1} (\alpha (L - \tau L) - (L_m - \tau L)) \quad (FS)$$

$$L_f + L_m + \tau (L - L_f) = L \quad (\text{Labor})$$

$$w_f L_f + w_m L_m + w_e \tau(L - L_f) + \Pi^f = Y \quad (\text{Resource})$$

$$V = (1 - \alpha)qL_m^\alpha \quad (\text{Value})$$

$$A = q(\tau + (1 - \tau)\frac{L_f}{L})\tau(L - L_f) \quad (\text{Technology})$$

$$Y = AL_m^\alpha \quad (\text{Output})$$

Solving for equilibrium

Using the labor constraint $L_f = L - \frac{L_m}{1-\tau}$, the zero-profit condition and $\gamma = 1$ the system of equilibrium equations can be reduced as follows:

$$w_m = \alpha q \frac{\tau}{1-\tau} (L - L_m) L_m^\alpha L^{-1}$$

$$w_f = (1 - \alpha)q\tau L_m^{1+\alpha} L^{-1}$$

$$w_e = q(L_m - \alpha L) L_m^\alpha L^{-1}$$

$$w_f \left(L - \frac{L_m}{1-\tau} \right) + w_m L_m + w_e \frac{\tau}{1-\tau} L_m = q \frac{\tau}{1-\tau} (L - L_m) \frac{L_m^{1+\alpha}}{L}$$

This is a system of four equations and four unknown variables, which gives us the following solution for an equilibrium:

$$L_m = (\alpha + \tau - \alpha\tau)L$$

$$L_f = \left(1 - \alpha - \frac{\tau}{1-\tau} \right) L$$

$$T = \tau(L - L_f) = \left(\alpha\tau + \frac{\tau^2}{1-\tau} \right) L$$

$$w_m = \alpha(1 - \alpha)q\tau(\alpha + \tau - \alpha\tau)^\alpha L^\alpha$$

$$w_f = (1 - \alpha)q\tau(\alpha + \tau - \alpha\tau)^{1+\alpha} L^\alpha$$

$$w_e = (1 - \alpha)q\tau(\alpha + \tau - \alpha\tau)^\alpha L^\alpha$$

$$\frac{w_f}{w_m} = \frac{\alpha + \tau - \alpha\tau}{\alpha}$$

$$\Pi_f = 0$$

$$V = (1 - \alpha)q(\alpha + \tau - \alpha\tau)^\alpha L^\alpha$$

$$A = (1 - \alpha)q\tau(\alpha + \tau - \alpha\tau)L$$

$$Y = (1 - \alpha)q\tau(\alpha + \tau - \alpha\tau)^{1+\alpha}L^{1+\alpha}$$

3.7 Social optimum

The problem of a social planner can be written as follows:

$$\begin{aligned} \max Y &= q\tau(L - L_m)(L - L_f)\frac{L_m^\alpha}{L} \\ \text{s.t. } L_m + (1 - \tau)L_f &= (1 - \tau)L \end{aligned}$$

Using the labor constraint the output can be rewritten as follows:

$$\begin{aligned} Y &= q\frac{\tau}{1 - \tau}(L - L_m)\frac{L_m^{1+\alpha}}{L} \\ &= q\frac{\tau}{1 - \tau}\left(L_m^{1+\alpha} - \frac{L_m^{2+\alpha}}{L}\right) \end{aligned}$$

FOC:

$$\begin{aligned} q\frac{\tau}{1 - \tau}\left((1 + \alpha)L_m^\alpha - (2 + \alpha)\frac{L_m^{1+\alpha}}{L}\right) &= 0 \\ \Leftrightarrow (1 + \alpha)L &= (2 + \alpha)L_m \\ \Rightarrow L_m^* &= \frac{1 + \alpha}{2 + \alpha}L \end{aligned}$$

This results in the following solution of the social planner:

$$\begin{aligned} L_m^* &= \frac{1 + \alpha}{2 + \alpha}L \\ L_f^* &= \frac{1 - \tau(2 + \alpha)}{(1 - \tau)(2 + \alpha)}L \\ w_m^* &= \alpha q\frac{\tau}{1 - \tau}\frac{(1 + \alpha)^\alpha}{(2 + \alpha)^{1+\alpha}}L^\alpha \\ w_f^* &= (1 - \alpha)q\tau\left(\frac{1 + \alpha}{2 + \alpha}\right)^{1+\alpha}L^\alpha \\ \frac{w_f^*}{w_m^*} &= \frac{(1 - \alpha)(1 + \alpha)(1 - \tau)}{\alpha} \\ \Pi_f^* &= 0 \\ V^* &= (1 - \alpha)q\left(\frac{1 + \alpha}{2 + \alpha}\right)^\alpha L^\alpha \end{aligned}$$

$$A^* = q \frac{\tau}{1-\tau} \frac{1+\alpha}{(2+\alpha)^2} L$$

$$Y^* = q \frac{\tau}{1-\tau} \frac{(1+\alpha)^{1+\alpha}}{(2+\alpha)^{2+\alpha}} L^{1+\alpha}$$

Comparison with the market equilibrium

If we compare the solution of the social planner with the solution of the decentralized equilibrium, we get the following results:

$$L_m^* \geq L_m$$

$$\Leftrightarrow \frac{1+\alpha}{2+\alpha} L \geq (\alpha + \tau - \alpha\tau)L$$

$$\Leftrightarrow \tau \leq \frac{1-\alpha-\alpha^2}{2-\alpha-\alpha^2}$$

$$L_f^* \geq L_f$$

$$\Leftrightarrow \frac{1-\tau(2+\alpha)}{(1-\tau)(2+\alpha)} L \geq (1-\alpha - \frac{\tau}{1-\tau})L$$

$$\Leftrightarrow \tau \geq \frac{1-\alpha-\alpha^2}{2-\alpha-\alpha^2}$$

Hence, for τ sufficiently small there is too little labor in the manufacturing and too much labor in the financial sector in the market equilibrium compared to the socially optimal sectoral employment. In other words, if talent is a scarce resource, the financial sector exerts a negative externality by recruiting labor beyond the socially desirable level, and herewith absorbing talents from the productive sector. Therefore, the decentralized equilibrium is inefficient.

4 Concluding Remarks (current state of the project)

This paper set out with the aim of assessing the empirical relationship between intersectoral wage inequality and economic growth in the U.S. states during the time period from 1977 to 2011. The following conclusions can be drawn from the present study. The econometrical results have shown that generally there is a significant negative correlation between intersectoral

wage inequality and subsequent economic growth within a state over time, where the most robust finding is a negative effect of the relative wage in the financial sector with respect to manufacturing sector on the subsequent growth rate.

Within the study, it was also hypothesized that relative high wages in the financial sector attracting talented employees from other sectors might cause negative impact on the growth rate of an economy. This hypothesis has found sufficient empirical evidence analyzing the data on the financial and manufacturing sectors in individual states of the United States over the considered time period.

In the theoretical part we developed a simple static model of financial intermediation, entrepreneurship and growth with perfect labor market, that helps to explain the observed empirical regularities. The model generates two important insights about the financial sector. First, the decentralized equilibrium exhibits a misallocation of talent: the financial sector by paying relatively higher wage absorbs talents beyond the social optimum. Second, the size of the financial sector as measured by the labor force is inefficiently large in the decentralized equilibrium. Especially, the model implies that the optimal size of the financial sector is larger for countries and periods with a higher fraction of talents.

This research has thrown up much potentiality for further investigation. First, it is recommended that further work should be undertaken on developing the theoretical dynamic model that can explain the link between the relative wages in finance and the subsequent economic growth in a time dimension. Second, further empirical investigations are needed to estimate this relation in other countries or at the cross-national level. Considerably more research work need to be done on the hypothesis proposed within this thesis. A future study exploring how the allocation of talent across the economic sectors affects growth performance would have a number of important implications for future economic policy.

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Figures and Tables

Figure 1: Relative Wage in Finance and Growth Rate in the U.S.

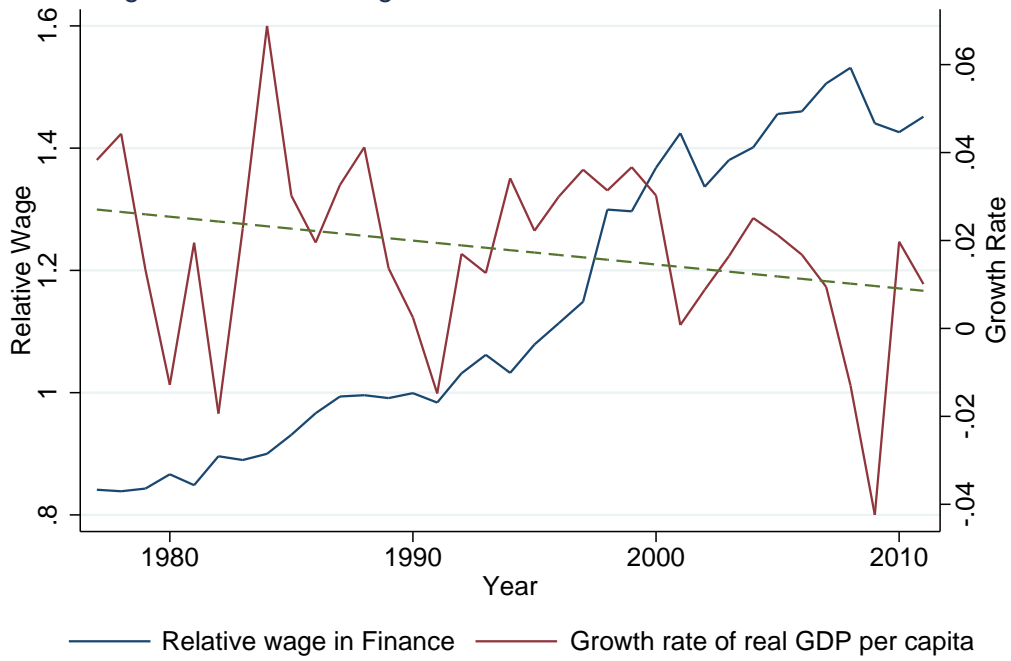


Figure 2: Sectoral Employment in the U.S.

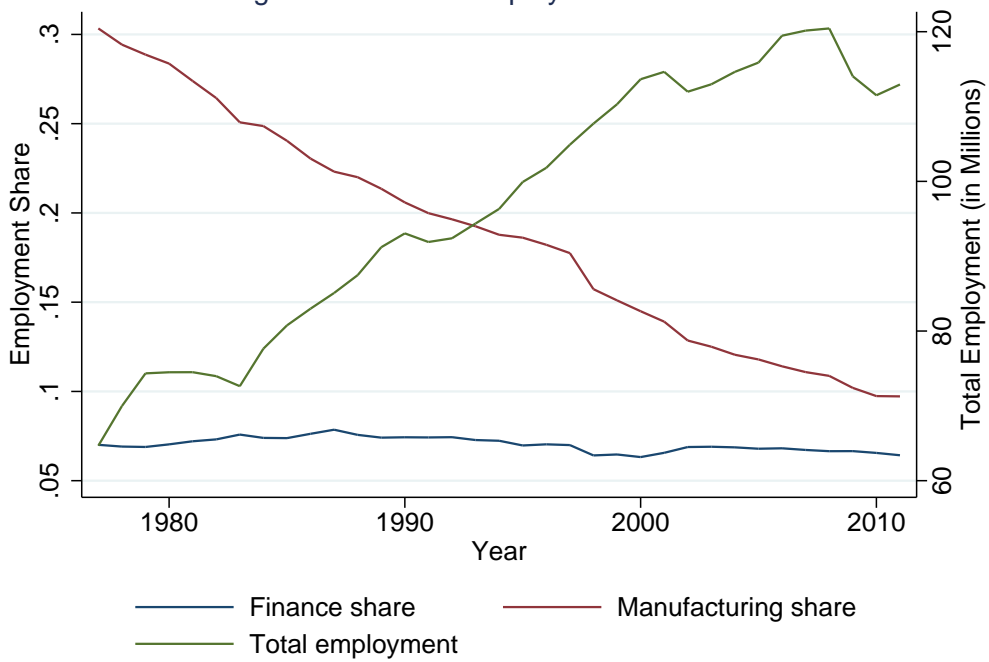


Figure 3: Increasing intersectoral wage inequality in the U.S. states

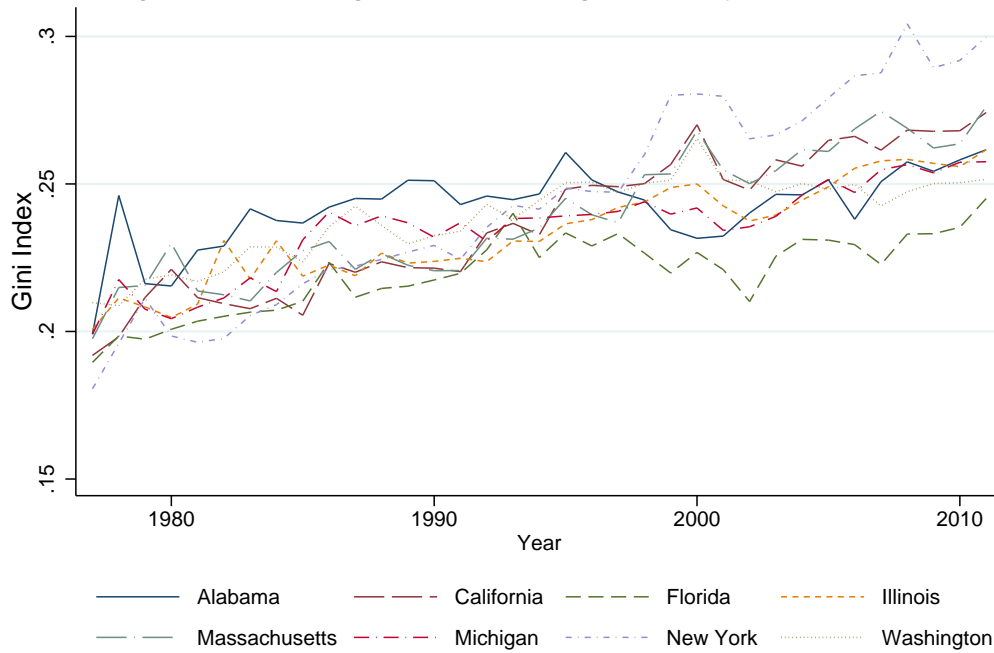


Figure 4: Growth rates in the U.S. states

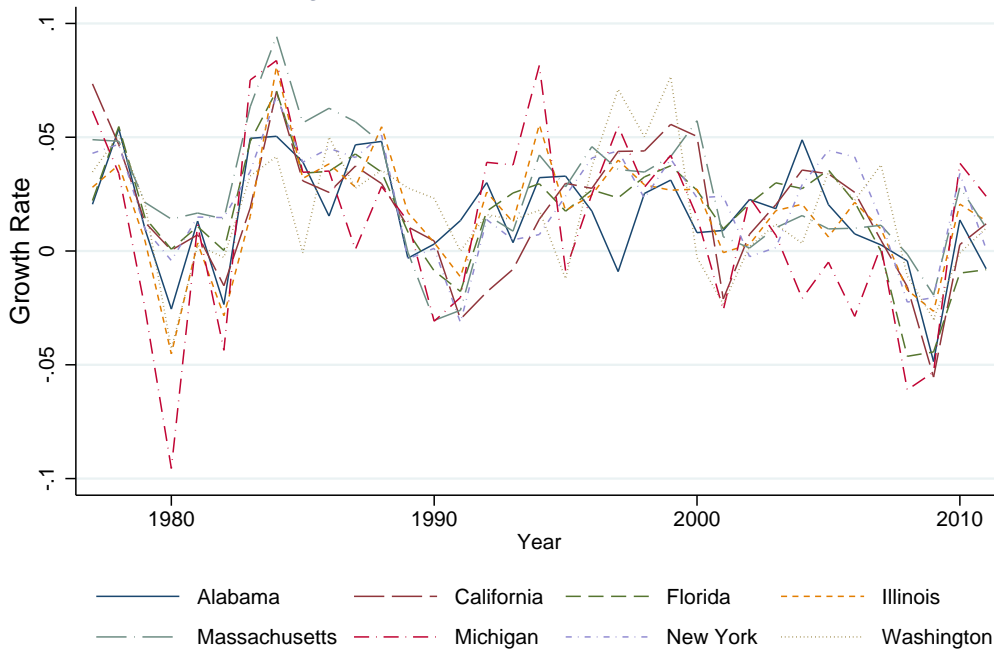
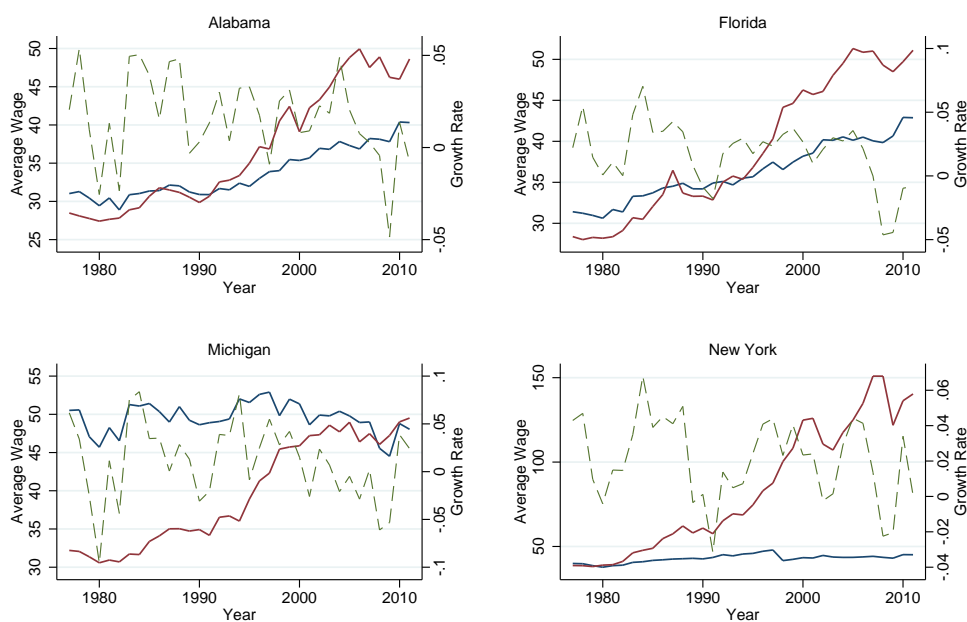


Figure 5: Wage dispersion and growth rate in the U.S. states



Notes: red line - financial sector, blue line - manufacturing sector, dash line - real GDP per capita growth rate

Table 1: Growth Rate on the Gini Coefficient of Average Wage

Dependent variable:	$Growth_{s,t}$				
Estimation method:	GMM	FE	TFE	FE+ST	TFE+ST
Independent variables	(1)	(2)	(3)	(4)	(5)
$Growth_{s,t-1}$	-0.0515** (0.0237)	0.0378* (0.0210)	0.0012 (0.0296)	0.0285 (0.0272)	-0.0421 (0.0351)
$\log(real\ GDP\ per\ capita)_{s,t-1}$	-0.1967*** (0.0332)	-0.1418*** (0.0190)	-0.1323*** (0.0161)	-0.2461*** (0.0388)	-0.1541*** (0.0279)
$Gini\ (Average\ Wage)_{s,t-1}$	-0.6607*** (0.1263)	-0.3119*** (0.0792)	-0.0246 (0.0803)	-0.5185*** (0.1295)	-0.1814 (0.1366)
$\log(Total\ Number\ of\ Employees)_{s,t-1}$	0.0268 (0.0236)	0.0127 (0.0179)	0.0239 (0.0250)	0.1062*** (0.0368)	0.0097 (0.0306)
$\log(Total\ Number\ of\ Establishments)_{s,t-1}$	-0.0448** (0.0198)	-0.0256 (0.0199)	-0.0553* (0.0309)	-0.0319** (0.0152)	-0.0828** (0.0408)
$Period_t$	0.0160*** (0.0018)	0.0106*** (0.0016)			
Observations	350	400	400	400	400
Within R-sq		0.46	0.61	0.65	0.75

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.

Period length: 4-year

Table 2: Growth Rate on the Gini Coefficient and the Relative Wage in the Financial Sector

Dependent variable:	$Growth_{s,t}$				
Estimation method:	GMM	FE	TFE	FE+ST	TFE+ST
Independent variables	(1)	(2)	(3)	(4)	(5)
$Growth_{s,t-1}$	-0.0712*** (0.0249)	0.0222 (0.0247)	-0.0033 (0.0281)	0.0084 (0.0289)	-0.0374 (0.0352)
$\log(real\ GDP\ per\ capita)_{s,t-1}$	-0.1946*** (0.0265)	-0.1432*** (0.0133)	-0.1351*** (0.0124)	-0.2615*** (0.0362)	-0.1670*** (0.0337)
$Gini\ (Average\ Wage)_{s,t-1}$	-0.4896*** (0.1382)	-0.2644*** (0.0841)	-0.0102 (0.0802)	-0.2357 (0.1736)	-0.1124 (0.1346)
$Relative\ Wage_{s,t-1}$	-0.0539** (0.0234)	-0.0514*** (0.0138)	-0.0361** (0.0146)	-0.0925*** (0.0247)	-0.0466** (0.0218)
$\log(Total\ Number\ of\ Employees)_{s,t-1}$	0.0350 (0.0227)	0.0163 (0.0172)	0.0217 (0.0236)	0.1443*** (0.0373)	0.0224 (0.0377)
$\log(Total\ Number\ of\ Establishments)_{s,t-1}$	-0.0608*** (0.0191)	-0.0343* (0.0181)	-0.0561* (0.0284)	-0.0706*** (0.0164)	-0.0852** (0.0417)
$Period_t$	0.0185*** (0.0020)	0.0134*** (0.0015)			
Observations	323	374	374	374	374
Within R-sq		0.47	0.62	0.68	0.75

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year

Table 3a: Growth Rate on the Relative Wage in the Financial Sector

Dependent variable:	$Growth_{s,t}$				
Estimation method:	GMM	FE	TFE	FE+ST	TFE+ST
Independent variables	(1)	(2)	(3)	(4)	(5)
$Growth_{s,t-1}$	-0.0772*** (0.0241)	0.0244 (0.0245)	-0.0033 (0.0280)	0.0021 (0.0286)	-0.0401 (0.0351)
$\log(real\ GDP\ per\ capita)_{s,t-1}$	-0.1905*** (0.0250)	-0.1421*** (0.0131)	-0.1351*** (0.0123)	-0.2637*** (0.0365)	-0.1674*** (0.0341)
$Relative\ Wage_{s,t-1}$	-0.0635*** (0.0238)	-0.0523*** (0.0141)	-0.0360** (0.0146)	-0.0998*** (0.0220)	-0.0498** (0.0223)
$\log(Total\ Number\ of\ Employees)_{s,t-1}$	0.0386* (0.0231)	0.0157 (0.0170)	0.0218 (0.0233)	0.1544*** (0.0355)	0.0256 (0.0383)
$\log(Total\ Number\ of\ Establishments)_{s,t-1}$	-0.0565*** (0.0191)	-0.0313* (0.0179)	-0.0562* (0.0281)	-0.0691*** (0.0153)	-0.0841** (0.0417)
$Period_t$	0.0169*** (0.0021)	0.0126*** (0.0015)			
Observations	323	374	374	374	374
Within R-sq		0.46	0.62	0.68	0.75

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year

Table 3b: Growth Rate on the Relative Wage in the Central Bank Subsector

Dependent variable: Estimation method: Independent variables	<i>Growth_{s,t}</i>				
	GMM (1)	FE (2)	TFE (3)	FE+ST (4)	TFE+ST (5)
<i>Growth_{s,t-1}</i>	-0.1984*** (0.0326)	-0.1040** (0.0392)	-0.0572 (0.0414)	-0.2092*** (0.0485)	-0.2084*** (0.0607)
$\log(\text{real GDP per capita})_{s,t-1}$	-0.1661*** (0.0267)	-0.1385*** (0.0204)	-0.1333*** (0.0202)	-0.2802*** (0.0564)	-0.2481*** (0.0524)
<i>Relative Wage_{s,t-1}</i>	-0.0446** (0.0223)	-0.0414* (0.0228)	-0.0225 (0.0197)	-0.0686** (0.0299)	-0.0266 (0.0226)
$\log(\text{Total Number of Employees})_{s,t-1}$	0.0376*** (0.0145)	0.0323*** (0.0109)	0.0189 (0.0170)	0.1174** (0.0523)	0.1133** (0.0512)
$\log(\text{Total Number of Establishments})_{s,t-1}$	-0.1097*** (0.0195)	-0.0672*** (0.0166)	-0.0515* (0.0261)	-0.1006*** (0.0234)	-0.1431** (0.0565)
<i>Period_t</i>	0.0207*** (0.0013)	0.0151*** (0.0010)			
Observations	244	296	296	296	296
Within R-sq		0.56	0.64	0.80	0.83

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year

Table 3c: Growth Rate on the Relative Wage in the Real Estate Subsector

Dependent variable: Estimation method: Independent variables	<i>Growth_{s,t}</i>				
	GMM (1)	FE (2)	TFE (3)	FE+ST (4)	TFE+ST (5)
<i>Growth_{s,t-1}</i>	-0.0597** (0.0268)	0.0306 (0.0200)	0.0103 (0.0277)	0.0097 (0.0265)	-0.0199 (0.0370)
$\log(\text{real GDP per capita})_{s,t-1}$	-0.1722*** (0.0183)	-0.1308*** (0.0102)	-0.1289*** (0.0118)	-0.2161*** (0.0231)	-0.1656*** (0.0229)
<i>Relative Wage_{s,t-1}</i>	-0.1421*** (0.0150)	-0.1052*** (0.0125)	-0.0608*** (0.0166)	-0.1473*** (0.0170)	-0.0807*** (0.0231)
$\log(\text{Total Number of Employees})_{s,t-1}$	0.0562*** (0.0180)	0.0232 (0.0151)	0.0224 (0.0214)	0.1382*** (0.0234)	0.0524* (0.0301)
$\log(\text{Total Number of Establishments})_{s,t-1}$	-0.0717*** (0.0171)	-0.0377** (0.0165)	-0.0521* (0.0263)	-0.0620*** (0.0157)	-0.0803** (0.0330)
<i>Period_t</i>	0.0149*** (0.0012)	0.0113*** (0.0010)			
Observations	343	395	395	395	395
Within R-sq		0.54	0.64	0.72	0.76

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year

Table 4: Growth Rate on the Relative Wage and the Relative Employment in the Financial Sector

Dependent variable:	<i>Growth_{s,t}</i>				
Estimation method:	GMM	FE	TFE	FE+ST	TFE+ST
Independent variables	(1)	(2)	(3)	(4)	(5)
<i>Growth_{s,t-1}</i>	-0.1454*** (0.0266)	-0.0005 (0.0288)	-0.0034 (0.0298)	-0.0549 (0.0360)	-0.0705* (0.0366)
$\log(\text{real GDP per capita})_{s,t-1}$	-0.1664*** (0.0317)	-0.1323*** (0.0152)	-0.1350*** (0.0126)	-0.2290*** (0.0412)	-0.1549*** (0.0370)
<i>Relative Wage_{s,t-1}</i>	-0.0640*** (0.0217)	-0.0473*** (0.0146)	-0.0360** (0.0136)	-0.1104*** (0.0220)	-0.0586** (0.0223)
<i>Relative Employment_{s,t-1}</i>	-0.0580*** (0.0127)	-0.0211** (0.0093)	-0.0002 (0.0128)	-0.0482*** (0.0174)	-0.0251** (0.0123)
$\log(\text{Total Number of Employees})_{s,t-1}$	0.0178 (0.0229)	0.0094 (0.0156)	0.0218 (0.0234)	0.1160*** (0.0384)	0.0162 (0.0383)
$\log(\text{Total Number of Establishments})_{s,t-1}$	-0.0393** (0.0166)	-0.0220 (0.0163)	-0.0561* (0.0287)	-0.0645*** (0.0157)	-0.0848* (0.0429)
<i>Period_t</i>	0.0178*** (0.0020)	0.0123*** (0.0015)			
Observations	323	374	374	374	374
Within R-sq		0.47	0.62	0.69	0.75

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year

Table 5: The Relative Wage in the Financial Sector on Growth Rate

Dependent variable:	<i>Relative Wage_{s,t}</i>				
Estimation method:	GMM	FE	TFE	FE+ST	TFE+ST
Independent variables	(1)	(2)	(3)	(4)	(5)
<i>Relative Wage_{s,t-1}</i>	0.1221* (0.0737)	0.6679*** (0.0477)	0.7412*** (0.0432)	0.1357** (0.0633)	0.1838** (0.0718)
<i>Growth_{s,t-1}</i>	0.3781*** (0.1320)	0.1101 (0.1692)	-0.2269* (0.1156)	0.1643 (0.1880)	-0.1759 (0.1547)
$\log(\text{real GDP per capita})_{s,t-1}$	-0.0806* (0.0444)	-0.0073 (0.0415)	0.0314 (0.0496)	-0.3033*** (0.0706)	0.0276 (0.1436)
$\log(\text{Total Number of Employees})_{s,t-1}$	0.0257 (0.0604)	-0.1313*** (0.0431)	-0.0782 (0.0621)	0.3176*** (0.1094)	-0.2390 (0.2286)
$\log(\text{Total Number of Establishments})_{s,t-1}$	-0.0171 (0.0632)	0.1222** (0.0478)	-0.0104 (0.0705)	-0.0613 (0.1082)	-0.0024 (0.2860)
<i>Period_t</i>	0.0441*** (0.0090)	0.0168** (0.0063)			
Observations	311	361	361	361	361
Within R-sq		0.82	0.89	0.94	0.96

Note: Robust standard errors are in parentheses. *, **, *** represent significance at 10%, 5%, 1% respectively.
Period length: 4-year