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The Global Rise of Asset Prices and the Decline of the Labor Share*

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Abstract

The labor income share has been decreasing across countries since the early 1980s, sparking a growing literature about the causes of this trend (Karabarbounis and Neiman, 2014; Piketty and Zucman, 2014; among many others). At the same time, there has been a steady increase in asset prices. We build a simple model to argue that the increase in the value of financial assets crowds out capital formation. The negative impact of asset prices on the capital-output ratio declines the labor share if capital and labor are aggregate complements. Based on a common factor model, we find that the global increase of Tobin's Q can account for up to 57% of the labor share decline. We highlight three potential factors that operate through the same theoretical channel: capital income taxes, capitalized market power rents and corporate governance frictions.

JEL Codes: E25, E44, E22.

Keywords: Tobin's Q, Labor Share, Asset Prices, Capital-Output ratios.

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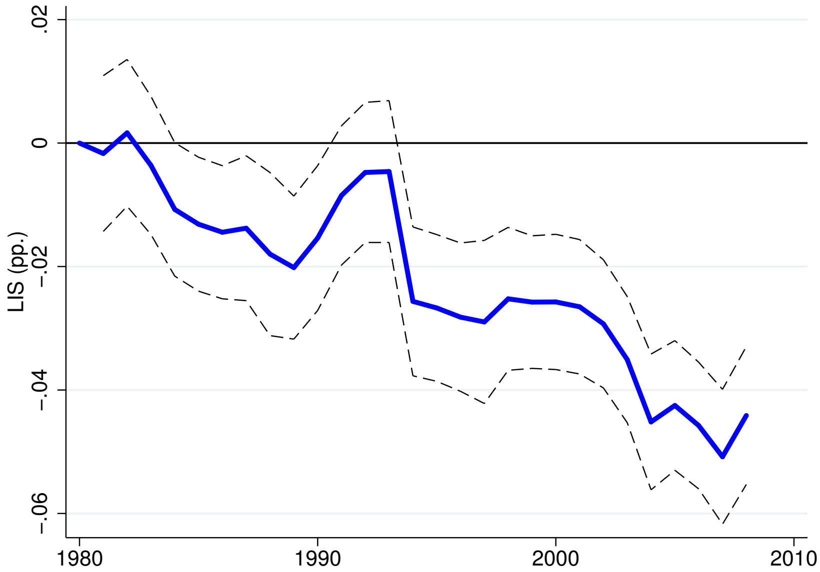
1 Introduction

The labor income share has declined globally in recent decades. Karabarbounis and Neiman (2014) document that the labor share has fallen significantly since the early 1980s, across the large majority of countries and industries. Meanwhile, stock market prices have increased with respect to investment flows and physical capital stock. In this paper we offer a novel explanation that connects these two phenomena. We argue that the rise of asset valuations affects the labor share through a slowdown of corporate investment. In our setup, financial wealth crowds out capital formation and has a negative impact on the labor share. Hence, our theory is not based on higher capital deepening and aggregate capital-labor substitutability, as recent contributions in the labor share literature. On the contrary, we propose an explanation that is based on aggregate complementarity between capital and labor. There are several mechanisms that operate through our theoretical channel. We explore three of them: dividend income taxes, corporate governance frictions and the capitalization of future market power rents. We find evidence consistent with these three specific mechanisms.

Figure 1 presents the evolution of the global labor share, according to our data. We plot the year fixed effects from a GDP-weighted regression along with its 90% confidence intervals. We include country fixed effects to control for countries entering and exiting the data set. Taking 1980 as the reference year, we observe that the global labor share has exhibited a clear downward trend only disrupted by the sudden -but short lived- rise in the early nineties. If we normalize 1980 to equal its weighted average value (57%), labor share reaches a level of roughly 52% at the end of the sample, implying an actual decline of 8.9% during the period considered.

There is a growing literature that attempts to explain the decline of the labor share. An important branch of this literature uses cross-country data and emphasizes the role of capital deepening. This branch usually assumes a constant elasticity of substitution (CES) production function with an elasticity σ larger than one, and exploits the one-to-one relation between the labor share and the capital-output ratio that is characteristic of the CES technology. In this context, any structural driver that increases the capital-output ratio has a negative impact of the labor share. Piketty and Zucman (2014), for example, argue that a persistent gap between the return to capital and the growth rate of the economy results in a growing accumulation of capital because capitalists save most of their income. Karabarbounis and Neiman (2014) argue that the persistent global decrease in the relative price of investment goods has induced firms to use more capital at the expense of labor, increasing the accumulation of physical capital and depressing the labor income share.[1]

Figure 1: Global Labor Share



Notes: Own calculations obtained as year fixed effects (along with its 90% confidence interval.) from a GDP-weighted regression including country fixed effects to control for the entry and exit of countries throughout the sample. The coverage is presented in Table B1 (915 observations, 41 countries).

The degree of substitutability between capital and labor required by these studies, however, has seldom been found in the empirical literature. Economists have often estimated values of σ far below one, which indicate that labor and capital are aggregate complements. (Antràs, 2004; Chirinko, 2008; León-Ledesma et al., 2010).[2] Recently, Chirinko and Mallick (2017) used a sectoral dataset and combined a low-pass filter with panel data techniques, to find an aggregate elasticity of substitution of 0.4. Furthermore, when they allow the elasticity to differ across sectors, they find that all the sectoral values are below 1. Also, Oberfield and Raval (2014) use micro data and build up an aggregate elasticity for the manufacturing sector of 0.7. These results suggest that mechanisms that work exclusively through capital deepening do not fully explain the labor share decline. There-

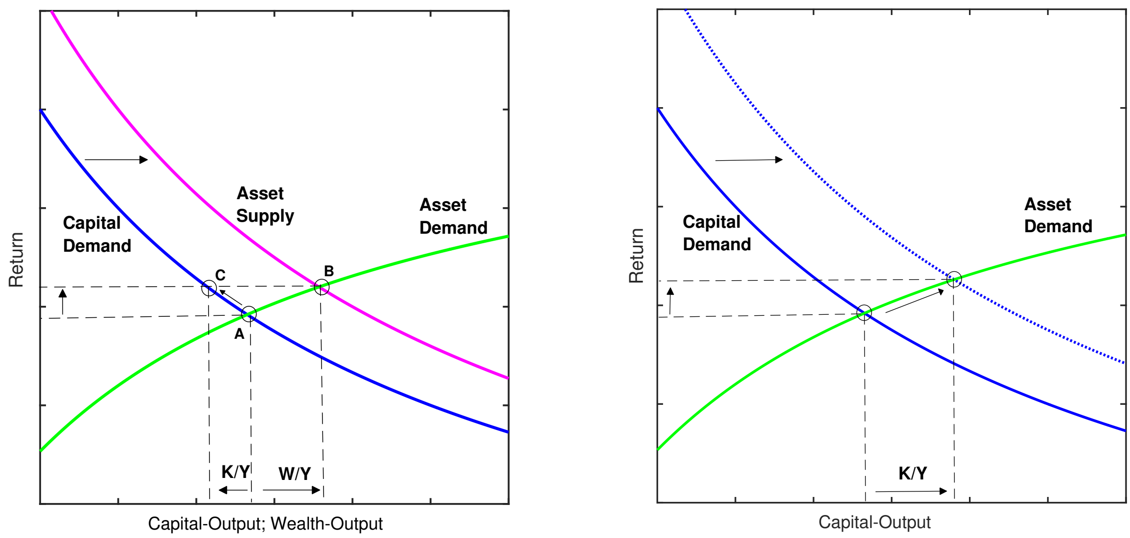
[1]IMF (2017) also emphasizes the role of the relative price of investment goods and other capital deepening factors. Crivellaro and Karadimitropoulou (2019) emphasize the role of financing constraints, which is also a capital deepening channel.

[2] Chirinko (2008) provides a summary of the empirical literature and lists estimates from different papers, concluding that "the weight of the evidence suggests that gross σ lies in the range between 0.40 and 0.60".

fore, alternative theories that do not rely on this channel are needed.[3,4] In this paper, we propose an alternative theory that reconciles the decline of the labor share with these estimates. Instead of looking at the relative price of capital goods or any other factor that reduces the user cost of capital, we look at the role of financial wealth and its effect on investment. For the corporate sector, we argue that the widespread increase in stock prices has occurred at the expense of investment. The intuition behind our argument is the following: Suppose there is an increase in the value of financial assets. If capitalists have a preference for wealth accumulation, they will demand a higher return to hold this additional wealth. In equilibrium, firms respond by reducing investment. The decline of investment depresses the capital-output ratio which, in turn, has a negative impact on the labor share if $\sigma < 1$.

This mechanism also exploits the CES' one-to-one relationship between the labor share and the capital-output ratio. However, our argument is not based on an exogenous decrease in the user cost of capital or another expansionary capital deepening factor. Instead, it is based on a negative general equilibrium relation between changes in asset prices and the capital-output ratio. The following graphical analysis illustrates the mechanism.

Figure 2: Capital Market



(a) Increase in Average Tobin's Q (b) Decline in the Relative Price of Capital Goods

[3]Most of the debate that followed Piketty's Capital publication was actually about the value of σ. See for example Rognlie (2015) and Raval (2017).

[4]In a recent contribution, Glover and Short (2017) argue that Karabarbounis and Neiman's estimates of the elasticity of substitution are biased because they ignore consumption growth effects during the period in which the relative price of investment goods have changed.

Figure 2.**a** shows a capital market with a standard capital demand and an increasing asset demand (i.e. supply of savings). In a frictionless environment, equilibrium occurs when these two curves intersect (point A). Now, suppose that the financial value of capital increases and that this increase is just a pure valuation effect (i.e. a change in the financial value of capital, not in the stock of capital). The asset supply shifts to the right while the capital demand does not shift. The new equilibrium occurs at the intersection between the asset supply and the asset demand (point B). This equilibrium is characterized by higher returns and, given the financial gain, higher wealth-output ratio. However, the demand of capital has not shifted. At equilibrium B the economy has to produce a higher return with the same capital demand schedule. This produces a movement along this schedule, from A to C, that increases the productivity of capital and thus the return to capitalists. The result is an economy with higher wealth-output ratio, lower capital-output ratio and higher returns. If $\sigma < 1$, this economy is also characterized by a lower labor share. Average Tobin's Q plays an important role because it captures the pure valuation effect that triggers the general equilibrium mechanism. This is observed in the definition of asset supply which, in a market for corporate equity, equals the product of Q and capital k:

$$v(r) = Q \cdot k(r) \tag{1}$$

While most of the labor share studies have focused on channels that work through changes in $k(r)$, including Karabarbounis and Neiman (2014), we focus on changes in Q and potential channels that work through them. To illustrate our mechanism vis-à-vis Karabarbounis and Neiman's channel, we can use the same capital market to show the effects of a decline in the relative price of capital goods. Figure 2.**b** shows this scenario. Here, there is not any valuation effect, and therefore there is no need to distinguish between the asset supply and the demand of capital. In response to a decline in capital goods prices, firms demand more capital, which shifts the capital demand to the right. The result is an equilibrium characterized by higher returns, higher capital-output ratio and, if $\sigma > 1$, lower labor share.[5,6] A similar analysis follows for other capital deepening forces that shift the demand curve to the right.

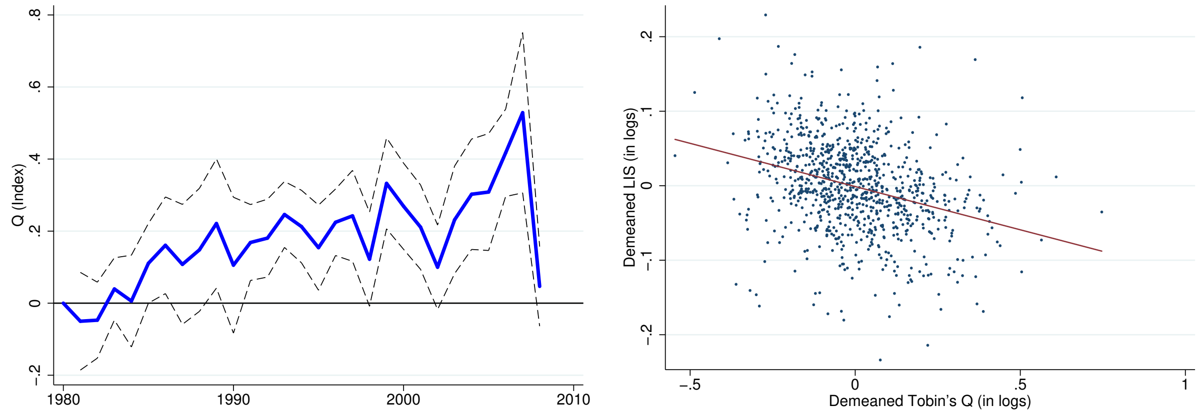
Figure 3 presents descriptive evidence of Tobin's Q and its relationship with the labor share. Figure 3.a shows the evolution of the global Tobin's Q according to our data by plotting the year fixed effects from a GDP-weighted regression where 1980 is taken as the reference year (1980 = 0). If we normalize 1980 to equal the Tobin's Q weighted

[5] To be precise, Karabarbounis and Neiman (2014) do not use an increasing asset demand. So their steady state results just imply higher capital-output, but constant returns.

[6] Nothing prevents us to consider forces that change Q and $K(r)$ at the same time. We show below that this is the usual case for market power.

average value in our sample (1.15), Figure 3.a displays a Tobin's Q increase of around 46% (from 1.15 in 1980 to 1.68 in 2007).[7,8] Figure 3.b presents descriptive evidence of this relationship between our two variables of interest. In particular, it shows a negative correlation between the labor share and Tobin's Q when we control for country fixed effects.

Figure 3: Labor Income Share and Tobin's Q, 1980-2009



(a) Global Tobin's Q (b) Labor Share and Tobin's Q

Notes: Figure a is obtained using year fixed effects (along with its 90% confidence interval.) from a GDP-weighted regression including country fixed effects to control for the entry and exit of countries throughout the sample. The coverage is presented in Table B1 (915 observations, 41 countries). Figure b is based on a (outlier-robust) sample of 41 countries and 911 observations. Variables are time-demeaned to control for country fixed effects. Correlation coefficient= -0.32^{***}.

Our main argument and empirical exercise are agnostic about the driving forces that have pushed up asset prices. We just want to see if changes in financial wealth relative to physical wealth are associated to declines in the labor share. However, we later explore potential Tobin's Q driving factors, and we find that the capitalization of market power rents, the decline of dividend income taxes and improvements in shareholder-value oriented corporate governance are consistent with our hypothesis.[9]

For our empirical analysis, we use recently developed panel time-series techniques that account for macroeconomics data characteristics (i.e., among others, long T, short N and nonstationarity). In particular, we present different mean group estimators which rely on

[7]Figure B1 in Appendix B shows the country-specific trends of our variables of interest. We can see that the trends showed in Figures 1 and 3.a document global facts and they are not merely driven by idiosyncratic factors in large countries.

[8]Figure 3.a also displays the collapse of Tobin's Q during the financial crisis. Our econometric methodology is well suited to control for these kind of short-run variations and, therefore, the long-run relationship should not be affected by them.

[9]These factors do not exhaust the determinants of Tobin's Q. Our mechanism could operate similarly for other factors that increase asset prices.

a common factor model approach. In contrast to standard panel data methods widely used in macroeconomics, this empirical approach deals in a tractable way with endogeneity issues arising from the presence of unobserved heterogeneity. We opt to further control for the relative price of investment goods to compare our mechanism with that of Karabarbounis and Neiman (2014).[10]

Our results show a robust and significant negative impact of Tobin's Q on the labor share that can explain up to 57% of its decline since 1980. However, we do not find any significant impact of the relative price of investment goods. Like in Chirinko and Mallick (2017), our results suggest that the decline of the labor income share cannot be explained by this particular capital deepening factor. We also find empirical support for our theoretical mechanism. More specifically, we show that the drivers considered in our analysis (dividend income tax rate, capitalized market power and corporate governance) interact with Q and physical investment in opposite directions.[11]

Since asset prices impact the labor share through an endogenous decline of the capital-output ratio, our results are consistent with the extensive literature that finds values of the elasticity of substitution well below one. We consequently conclude that deep causes for the secular decline of the labor share have to be found not in the accumulation of physical capital or in investment specific-technological changes, but in the way financial markets and corporations relate. In particular, the deep causes for factorial inequality should be found in policies or institutional changes that have increased financial wealth at the expense of real investment.

The remaining of the paper is structured as follows. The next subsection discusses related literature and places our contribution within it. Section 2 develops a theoretical framework that relates asset prices and Tobin's Q with the capital-output ratio and the labor share. Section 3 introduces and explains the data that we use in our empirical analysis. Sections 4 and 5 present, respectively, the econometric methodology and the results. Section 6 explores the potential determinants of Q, and Section 7 summarizes and concludes.

[10]Changes in the relative price of investment goods impacts the capital-output ratio but they do not change Tobin's Q. Figure B2 in Appendix B shows a lack of within-country correlation between these two variables.

[11]Note that we are not saying that market power reduces the labor share only via markups. We are saying that the financial capitalization of future markups depresses investment due to the financial wealth effect described in figure 2. This goes beyond the classic inefficiency of markups. See more later.

Related literature

Our paper is deeply connected to Piketty and Zucman (2014) for different reasons. They rely on increasing capital-output ratios to explain the recent evolution of factor shares. In this regard, their theory is opposed to ours. However, they also emphasize the role of asset prices and show compelling cross-country evidence on Tobin's Q. The main conceptual differences are that i) we do not assume that Tobin's Q is equal to one[12] and, more importantly, ii) we provide a theoretical framework where physical capital is crowded out by capital gains (i.e. capital responds endogenously to changes in asset valuations). Some of their data is consistent with our theory. For example, they find declining or stagnant trends when they calculate corporate capital-output ratios using the PIM method. And they also estimate that, in absence of capital gains, national wealth-income ratios would have remained stagnant or declined.[13]

Our mechanism also resembles that of Shell et al. (1969) who, using a version of the Solow model, show that productive capital can decrease when capital gains increase. In this respect, our model can be thought as a general equilibrium growth model with capital gains. Our paper is also closely related to Gutiérrez and Philippon (2016) who show, empirically, that investment has been low in U.S. industries where Tobin's Q has been high (in contrast to traditional Q theories). Brun and Gonzalez (2017) use a similar mechanism to ours to study the impact of market power and capital taxation in an economy with incomplete markets. Their argument is also based on general equilibrium valuation effects and they find that, due to such valuation effects, i) market incompleteness exacerbates the negative effect of market power on investment and ii) the observed effective decline in U.S. capital income taxes has intensified the negative macroeconomic effects of market power.

Finally, our paper is obviously connected to all the flourishing labor share literature. Instead of looking at the price of capital goods, as in Karabarbounis and Neiman (2014), we look at a different price, the financial valuation of capital, and its general equilibrium impact on the labor share. In a recent contribution, Koh et al. (2016) show that the rise of intellectual property products (IPP) capital accounts entirely for the observed decline of the U.S. labor share, reflecting the fact that the U.S. economy has been evolving towards a more IPP capital-intensive economy.[14] The role of the institutional framework

[12] The Tobin's Q argument was also remarked by Rowthorn (2014). Also, the distinction between capital and wealth was the main point of Stiglitz (2015)'s critique of Piketty (2014)

[13] See Piketty and Zucman (2014), Appendix Figures A71, A92, and A129, available online at `http://piketty.pse.ens.fr/en/capitalisback`

[14] Appendix C discussed in detail to what extent intangible assets affect our analysis.

has also received strong attention in the study of factor shares dynamics. The literature has focused on the impact of both labor and product market regulations. Kristal (2010), for example, finds that the dynamics of the labor share are largely explained by indicators for workers' bargaining power. Blanchard and Giavazzi (2003) emphasize that labor market regulations have a positive effect in the short-run, but negative in the long-run, because in the long-run employers can substitute capital for relatively more expensive labor. Leblebicioglu and Weinberger (2017) provide causal evidence showing that banking deregulation contributes to the decline of the labor share. Raurich et al. (2012) show that estimates of the elasticity of substitution are biased when price mark-ups are ignored. Recent research by Barkai (2017), Autor et al. (2017) and Kehrig and Vincent (2018) emphasize, respectively, the role of imperfect competition, the "superstar firms" phenomenon and the reallocation of value added to "hyper- productive" establishments to explain the evolution of the U.S. labor share. Our paper complements this research and shows that financial valuations might have general equilibrium effects on investment and the labor share, consistent with the empirical literature that finds values of σ below one. Our paper also contributes to the labor share literature from a methodological perspective: We look at this question using panel time-series techniques and controlling for common unobserved factors.

2 Theoretical Framework

This section presents a model that connects the labor share with the amount of financial wealth held, the level of physical capital stock and the financial value of capital. Our model refers to the corporate sector. In this context, financial wealth is the stock market value and the financial valuation of capital is the average Tobin's Q. To show the main result, subsection 2.1 presents a model where average Q is exogenous. In section 2.2, we endogenize Q. Our environment is very simple: there is a representative capitalist that accumulates stocks and receives direct utility from the ownership of wealth. The firm accumulates physical capital and distributes dividends to capitalists. We opt not to model the problem of the workers since it is straighforwad: workers supply labor l inelastically, receive labor income w, consume and do not save. Time is discrete.

2.1 A model with exogenous Q

2.1.1 Capitalists

We consider the problem of a representative capitalist household that consumes c, accumulates financial wealth a and receives return r from this wealth. The household derives utility from consumption and from the accumulation of wealth, according to the present utility function $u(c,a) = u(c) + h(a)$, where $u(c)$ is standard and $h(a)$ is increasing and concave in financial wealth a. Financial wealth is equal to the price of stocks v times the number of stocks held by the household. Every period, the household decides the amount of next period stocks s'. Therefore, the amount of financial wealth held at the end of the current period is $a' = vs'$. In this context, returns r are equity returns that satisfy $1 + r' = \frac{\text{div}' + v'}{v}$, where div is dividends paid by the firm.

In recursive form, the intertemporal problem of the household simplifies to:

$$
\begin{aligned}
V(a) = &\max_{c,a'} u(c) + h(a) + \beta V(a') \\
&s.t. \quad c + a' = (1+r)a
\end{aligned}
\tag{2}
$$

where we have exploited the change of variable $a' = vs'$. The term $h(a)$ implies that households derive direct utility from the ownership of wealth. Specifically, $h(a)$ relaxes the assumption that wealth only serves to finance future consumption and, under relatively general conditions, leads to an increasing steady state asset demand.[15][16] In a model where financial wealth plays a key role, like ours, the inclusion of wealth in the utility function is an appropriate assumption since the bulk of stock market wealth is mostly owned by households whose saving behaviour cannot be explained by the standard Euler equation (Carroll, 1998).[17]

Solving (2), we get the following Euler equation:

$$
u'(c) = \beta\Big[u'(c')(1+r') + h'(a')\Big] \tag{3}
$$

[15] Wealth in the utility function was proposed by Carroll (1998) and is used by Francis (2009), Piketty (2011), Kumhof et al. (2015) and Saez and Stantcheva (2017), among others. In all these papers, the assumption that capitalists have a preference for wealth is a key modelling strategy.

[16] Saez and Stantcheva (2017) discuss different possible microfoundations for wealth in the utility function, including (i) bequest motives, (ii) entrepreneurship, (iii) service flows of liquidity and security, and (iv) motivated beliefs and social norms. For example, people might derive direct utility from wealth due to the service flows of social status and power that it provides (Carroll, 1998), or people might accumulate wealth due to dynastic (impure) altruism (DeNardi, 2004). Brun and Gonzalez (2017) use an incomplete market model to study the aggregate and distributional effects of changes in financial valuations. In an incomplete market model, the asset demand is increasing due to precautionary behavior.

[17] In the standard life-cycle model without bequest motive and wealth effects, an increasing savings function can be achieved but requires a CRRA parameter unrealistically low (below 1).

Evaluated at the steady state, equation 3 simplifies to:

$$\frac{1}{\beta} = 1 + r + \frac{h'(a)}{u'(ra)} \tag{4}$$

As shown in figure 2.a, an increasing asset demand is a crucial aspect for the comparative statics of the model. To preserve the general notation, we we will assume that the conditions that guarantee that $a(r)$ is an increasing function are met.[18] Note that equation 4 requires $r < \frac{1}{\beta} - 1$, as in the standard incomplete markets model (Hugget, 1993; Aiyagari, 1994). This is an interesting property because it allows us to interpret wealth in the utility function as a reduced form for precautionary savings.

2.2 Firms

Our model simply assumes that there is representative competitive firm that accumulates physical capital k, hires labor l, pay wages w, distribute dividends d to households and produces output y according to the standard CES technology:

$$y = \left[\phi k^{\left(\frac{\sigma-1}{\sigma}\right)} + (1-\phi) l^{\left(\frac{\sigma-1}{\sigma}\right)}\right]^{\frac{\sigma}{\sigma-1}} \tag{5}$$

where σ is the elasticity of substitution between capital and labor and ϕ is a distributional parameter. For simplicity, we assume that the firm does not issue new equity. The supply of equity s is fixed and equal to 1. The resulting demands for labor $l(w)$ and capital $k(r)$ are standard and derived from the first order conditions $F_l = w$ and $F_k = r + \delta$, respectively. Given the CES assumption, we have the standard one-for-one relationship between the labor share and the capital-output ratio, which is given by:

$$lis = 1 - \phi \left(\frac{k}{y}\right)^{\frac{\sigma-1}{\sigma}} \tag{6}$$

2.3 Equilibrium

Equilibrium occurs when the asset demand $a(r)$ equals the asset supply. Since $s = 1$, the asset supply simply equals the market value of the firm $v(r)$. Therefore, the equilibrium returns r^* are given by:

$$a(r) = v(r) \tag{7}$$

In a frictionless environment, the market value of the firm equals the market value of

[18] For example, if both $u(c)$ and $h(a)$ are CRRA functions, an increasing $a(r)$ would require the risk aversion parameter in $h(a)$ to be larger than that in $u(c)$, that is, marginal utility should diminish less rapidly in consumption than in wealth.

its assets k and the market clearing condition can be rewritten as $a(r) = k(r)$. This is equivalent to the equilibrium condition in an economy where households accumulate physical capital and rent it to firms. However, in a financial economy, the financial valuation of corporate capital (Tobin's Q) might be different to one, making the asset supply $v(r)$ equal to $Qk(r)$. At the steady state, Q can be different to one due to several reasons, including taxes, capitalized future market power rents or financial frictions.[19] To illustrate our general equilibrium mechanism, we postpone the discussion of such reasons to next section. Here, we just consider the realistic case that Q might be different to one, which implies the following market clearing condition:

$$a(r) = Qk(r) \tag{8}$$

This condition guarantees a unique equilibrium since $k(r)$ is monotonically decreasing and $a(r)$ is monotonically increasing. The next proposition states the negative relationship between Q and k shown by figure 2.**a**.

Proposition 1. *The relation between Q and equilibrium capital $k(r^*)$ is negative.*

Proof. Consider the asset market clearing condition $a(r) = v(r)$. For legibility, we suppress the evaluation at $(r^*; Q)$. By total differentiation, we have that

$$\frac{dr}{dQ} = \frac{\partial v}{\partial Q}\left(\frac{\partial a}{\partial r} - \frac{\partial v}{\partial r}\right)^{-1}$$

The first term $\frac{\partial v}{\partial Q}$ is positive and equal to k. The expression in parentheses equals $\frac{\partial a}{\partial r} - \frac{Q\partial k}{\partial r}$ and must be positive to guarantee a unique equilibrium. The result is a positive $\frac{dr}{dQ}$. Since $k(r)$ is monotonically decreasing, any change in Q that results in an increase in r will have a negative impact on k.

□

Lemma 1. *The relation between Q and the labor share is negative if $\sigma < 1$.*

This result is straightforward. Given that the production function displays constant returns to scale, any decline in k also declines the capital-output ratio. Given relation 6, an increase in Q that reduces the capital-output ratio also reduces the labor share if $\sigma < 1$. Therefore, our theoretical model predicts that an increase in financial wealth due to a change in the financial valuation of capital Q can contribute to the decline of the labor share through a slowdown of capital formation. The next section endogenizes the Q.

[19] Our mechanism is not based on Q-theory, where capital adjustment costs affect Q during transitions, but not at the steady state.

2.4 A model with endogenous Q

This section expands the model and endogenizes Q. The purpose of endogenizing Q is to illustrate that several mechanisms can operate through the same theoretical channel. To that effect, we consider an economy with monopolistic competition firms, dividend taxes and a corporate governance friction. In this economy, capitalists solve the same problem as in section 2.1.1, but they pay dividend income taxes. From firm i, they receive after-tax real returns

$$1 + r_i' = \frac{\text{div}_i'(1-\tau) + v_i'}{v_i}\frac{p}{p'} \tag{9}$$

2.4.1 Firms

The monopolistic competition setup is standard. There is a competitive final goods firm that aggregates intermediate goods using the Dixit-Stiglitz aggregator. The relative demand for variety i is $\frac{y_i}{y} = \left(\frac{p_i}{p}\right)^{-\xi}$ where p is the aggregate price index, ξ is the elasticity of substitution across varieties and y is total demand. Intermediate goods firms are monopolistically competitive. Intermediate firm i produces y_i according to 5, accumulates physical capital k_i, hires labor l_i, pays wages and distributes dividends to households. We model corporate governance frictions as in Sampson and Shi (2017), with a reduced-form friction in firms' discount factor that captures potential agency problems between the shareholders (capitalists) and intermediate firms. Similar specifications have been used by Korinek and Stiglitz (2009) and Chetty and Saez (2010), among others. The recursive problem of each intermediate firm is:

$$V(k_i) = \max_{k_i', l_i} \left\{ \frac{\text{div}(1-\tau)}{p} + \gamma \frac{V(k_i')}{1+r'} \right\} \tag{10}$$

subject to $p_i F(k_i, l_i) = w_i l_i + \text{div} + k_i' - (1-\delta)k_i$ and $\frac{y_i}{y} = \left(\frac{p_i}{p}\right)^{-\xi}$, where $1 \leq \gamma < 1 + r'$ reflects the potential agency conflict. Obviously, if $\gamma = 1$, the problem of the firm is consistent with the problem of the shareholders. Given that all firms face the same optimization problem, we focus on the symmetric equilibrium, where all the firms set the same price, own the same level of capital stock and produce the same quantity. Given the symmetry, we shall omit subscript i from now on.

Tobin's Q is defined as the market value of capital over its replacement cost. Since our model abstracts from corporate financial assets and non-equity liabilities, and $s = 1$, Tobin's Q is simply the ratio between equity price v and k. This results in the following steady state Tobin's Q[20] (see Appendix A for proof):

$$Q(r) = (1-\tau)\left(m(\gamma, r) + \frac{F(k(r), l)}{\xi r k(r)}\right) \tag{11}$$

where $m(\gamma, r) = \frac{1-\gamma+r}{\gamma r}$. Under this specification, Tobin's Q depends on parameters τ, γ and ξ and is not constant along equity returns r. Applying Tobin's Q definition and equation (A9), we obtain the following expression for the asset supply $v(r)$:

$$v(r) = Q(r) \cdot k(r) = (1-\tau)\left(k(r) \cdot m(\gamma, r) + \frac{F(k(r), l)}{\xi r}\right) \tag{12}$$

Note that if the firm maximizes shareholder value ($\gamma = 1$) and there is no effective monopoly power ($\xi \to \infty$), Tobin's Q is constant and equal to $1-\tau$. If there are not taxes on dividends either, Tobin's Q is simply one and the asset supply $v(r)$ will equal the demand of capital $k(r)$.

Expression (12) shows that $v(r)$ can change due to changes in $k(r)$, changes in $Q(r)$ or changes in both. For example, if $k(r)$ shifts upwards due to a decline in the relative price of capital goods or lower corporate taxes (both absent from the model, for simplicity), $v(r)$ will also shift upwards.[21] But $v(r)$ might change simply due to valuation effects that do not shift the demand of capital $k(r)$. This occurs, for example, when there is a change in the dividend income tax τ. In this case, $v(r)$ shifts upwards or downwards depending on whether τ decreases or increases, but the curve $k(r)$ remains unaltered because the dividend income tax doesn't change the first order condition of capital.[22] Finally, $v(r)$ can change if both $Q(r)$ and $k(r)$ change. This is the case of a lower ξ. On the one hand, it raises pure equity valuation through $Q(r)$ because future market power rents $\frac{1}{\xi}F(k(r), l)$ are capitalized. On the other hand, if we assume that the current markup also depends on ξ, the firm will lower the demand of capital $k(r)$ because a lower ξ increases the markup and reduces the optimal amount of output. The final effect on equilibrium capital will depend on both forces.[23] However, it should be noted the fact that most of the literature

[20] See Brun and Gonzalez (2017) for a step-by-step derivation of Tobin's Q in a growth model with taxes, imperfect competition and other frictions.

[21] Most of this effect will occur through the direct impact of $k(r)$ on $v(r)$, but note that the value of Tobin's Q depends on equity returns, so any change in $k(r)$ that has an effect on r will also impact Tobin's Q and will have an indirect effect on $v(r)$. This is the case in expression (A9).

[22] We also obtain the main result of the so called "New view of dividend taxation" literature. See McGrattan and Prescott (2005), among many others.

[23] It is worthy to note that our empirical strategy accounts for the impact of unobserved variables on the labor share and, therefore, our estimations are not affected by the fact that the markup has a direct

only emphasizes the markup channel, but not the general equilibrium effect through Q.[24]

2.5 Equilibrium

Equilibrium occurs when the asset demand equals the asset supply. More specifically, equilibrium returns r^* are given by:

$$a(r) = v(\,r\,) \equiv Q(\,r|\;\tau,\,\xi,\,\gamma) \cdot k(\,r\,), \tag{13}$$

where the equality is the equilibrium itself and the identity comes from Tobin's Q definition. Expression (13) shows that the equilibrium depends on Q and its determinants, which indicates that valuation changes can have real effects. To understand these effects, we shall focus first on changes in those determinants that alter $Q(r)$ without shifting $k(r)$. As explained in the paragraph above, this happens when there is a change in the dividend income tax τ. In response to a decrease in τ, Tobin's Q will increase and investors will demand a higher return to hold the additional financial wealth. In other words, an increase in Q implies an upward movement along the $a(r)$ curve. In response to that, firms reduce the level of investment. This occurs because the return to equity is paired with the marginal productivity of capital through its first order condition. The result is a higher r^* and lower equilibrium capital expenditures $k(r^*)$.

A similar mechanism operates through a lower elasticity ξ and a lower agency friction γ. A lower ξ implies higher capitalized future market power rents, which translates into higher Tobin's Q and produces the subsequent movement along $a(r)$ and the downward adjustment of firms' capital expenditures. In this case, however, this general effect is aggravated by the inwards shift of $k(r)$ that characterizes the optimal firms' decision when they enjoy market power, just as we described above. A lower γ also increases Q by raising $m(\gamma, r)$. The firm becomes more shareholder oriented, and this boosts asset prices at expense of capital expenditures. This is another potential mechanism that connects with the idea that big firms have become relatively more shareholder oriented over time, whose implications have been widely discussed (Lazonick and O'Sullivan, 2000; Davis, 2009; among many others) and that has been considered as one potential source for declining investment (Gutiérrez and Philippon, 2016). What our model shows is that the asset price valuation that results from such corporate governance friction can put further downward pressure on corporate investment.[25]

effect on the labor share.

[24] Brun and Gonzalez (2017) explore both channels.

[25] Piketty and Zucman (2014) argue that one plausible explanation for so much variation of Tobin's Q across countries might be the different level of protection of shareholders' rights, with Anglo-Saxon

Changes in τ, ξ and γ are not the only mechanisms that can have real equilibrium effects by changing Q. Any other mechanism that increases Q would imply a movement along $a(r)$ and would change the equilibrium pair r^* and k^* in a similar manner, implying similar distributional effects. This is the reason why in our main empirical exercise we opt to be agnostic about the determinants of Q and ask the more general question of how asset prices (Q in particular) are related to the labor share.

For simplicity, we have abstracted from Karabarbounis and Neiman (2014)'s relative price mechanism, but this can be easily embedded into our model by adding the relative prices of capital goods (RP) in the budget constraint of the firm:

$$F(k, L) = d + RP[k' - (1 - \delta)k] + w, \tag{14}$$

where the demand of capital depends positively on RP. In our model, the inclusion of RP would not affect Tobin's Q since relative prices are reflected both in its numerator and denominator. We will show that this lack of relationship is also consistent with the data. Lastly, to compare our mechanism with Karabarbounis and Neiman (2014)'s, we will also assess the impact of the relative prices of capital goods on the labor share.

3 Data

In order to empirically study the relationship between Tobin's Q and the labor income share, this paper combines three different databases to construct our three variables of interest.

3.1 Tobin's Q

Tobin's Q is defined as the market value of capital over its replacement cost. Empirically, we use data from the Worldscope database and follow Doidge et al. (2013) to compute a firm-level Tobin's Q as the sum of total assets less the book value of equity plus the market value of equity, divided by the book value of total assets, which is generally acknowledged as the most accurate available procedure, given the difficulty to obtain data of the replacement cost of capital. Indeed Chung and Pruitt (1994) find that a simple market-to-book ratio explains at least 96.6% of the variability of Tobin's Q -calculated as

countries being those with the highest level of protection and highest Tobin's Q. This hypothesis seems to be also consistent with the evidence shown by Gompers et al. (2003) for U.S. firms: firms with stronger shareholder rights seem to be also those with higher firm value and lower capital expenditures. Later we empirically check the relation between this mechanism and the evolution of Tobin's Q.

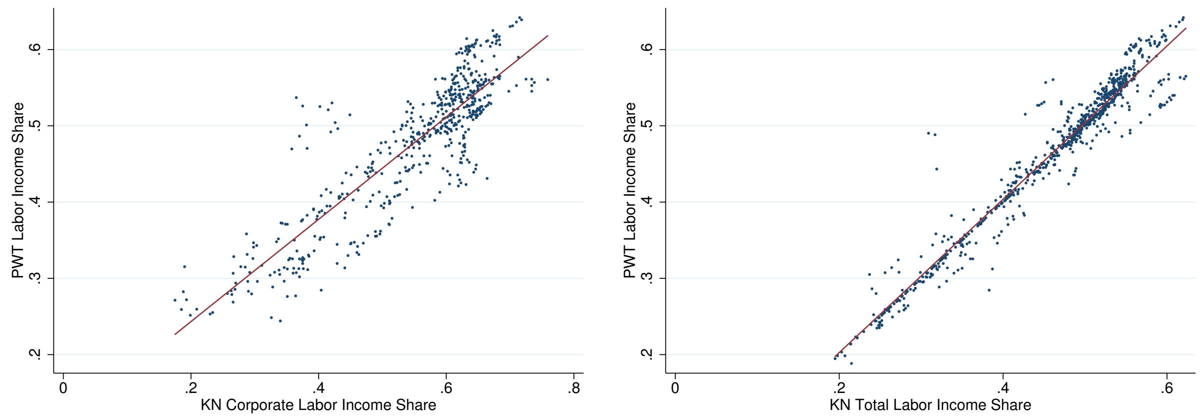
the market value of capital over its replacement cost.

A country-level Q is obtained by aggregating firm-level data from publicly traded companies following Doidge et al. (2013) methodology. That is, in a first stage firms are clustered in 17 different sectors using the Fama-French 17 industries classification, and a median Q is computed for each industry.[26] In a second step, countries' Q are calculated as the market value weighted average of the median industries' Q. The use of industry medians allows us to overcome the problem of potential outliers in the sample.[27]

3.2 Labor Income Share

Regarding the labor share, Karabarbounis and Neiman (2014) have developed a database of the corporate labor income share for a considerable number of countries obtaining the data from several sources. However, the use of their database would force us to exclude a non-negligible number of countries in our analysis. As an alternative, we employ the LIS variable from the Extended Penn World Table 4.0 (EPWT 4.0).

Figure 4: EPWT LIS vs KN LIS



(a) EPWT vs Corporate Labor Share

(b) EPWT vs Total Labor Share

The EPWT 4.0 draws information from several United Nations sources and defines the labor income share as the share of total employee compensation in the Gross Domestic Product with no adjustment for mixed rents, and without distinguishing the corporate sector. Although we are aware of the potential drawbacks of using this LIS definition, the

[26] Table B2 in Appendix B displays the Fama-French 17 industries classification.

[27] In order to be safe about potential outliers we just include sector-year pairs where we have data for at least three companies. Increasing the number of companies required per sector-year does not significantly alter our Q. In order to maximize the sample coverage of our analysis, Tobin's Q is calculated including the financial sector. Excluding the financial sector gives a Q with a 0.95 correlation with our variable.

high correlation between our variable with the corporate labor share and the total labor share used by Karabarbounis and Neiman (2014) -0.88 and 0.96 respectively (Figure 4)- suggests that this should not represent a major source of concern.

3.3 Relative Prices

The relative price of investment goods with respect to consumption goods is obtained by extending Karabarbounis and Neiman (2014) database. In order to obtain the relative price in domestic terms, we divide the country-specific relative price obtained from the Penn World Table 7.1 ($\frac{Pi_i}{Pc_i}$), which is calculated using ppp exchange rates, over the relative price of investment in the United States ($\frac{Pi_{US}}{Pc_{US}}$). We then multiply this ratio by the ratio of the investment price deflator to the personal consumption expenditure deflator for the United States ($\frac{ID_{US}}{PCD_{US}}$) obtained from the BEA.

$$RP = \frac{\frac{Pi_i}{Pc_i}}{\frac{Pi_{US}}{Pc_{US}}} * \frac{ID_{US}}{PCD_{US}}$$

3.4 Descriptive Correlations

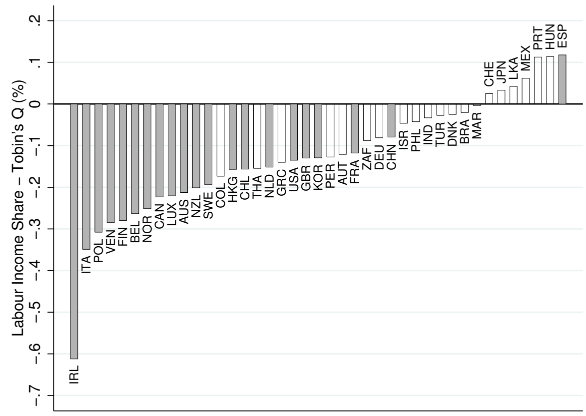
Figure 5 shows the country-specific correlations between our variables of interest.[28] The vertical axis reports the coefficient α_1 (in %) from a regression $\ln(Y_t) = \alpha_0 + \alpha_1 \ln(X_t) + \epsilon_t$, where, Y represents either the labor share or Tobin's Q, and X stands for Tobin's Q or the relative prices. Figure 5.a displays the already commented global negative relationship between the labor income share and Tobin's Q. On average, an increase in Tobin's Q of 1% is associated with a decline in the LIS of roughly 2%. Spain is the only country displaying a positive correlation between these variables significantly different from zero at 5% level. Figure 5.b studies the relationship between the labor share and our other variable of interest, the relative prices. Although the picture is less conclusive, it suggests the presence of a positive correlation between the two variables. However, Figure B3 in Appendix B shows that when we consider the information provided by all the countries, the within-country correlation is very small. Figure 5.c shows no pattern between Tobin's Q and the relative investment prices.

4 Empirical Methodology

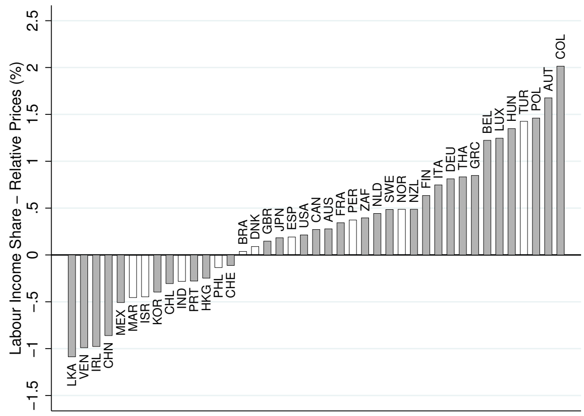
Assesing empirically the validity of the theoretical model carries several challenges. This section explains in detail (i) how we go from the theoretical model to an empirical equation,

[28] Table B3 in Appendix B shows their descriptive statistics.

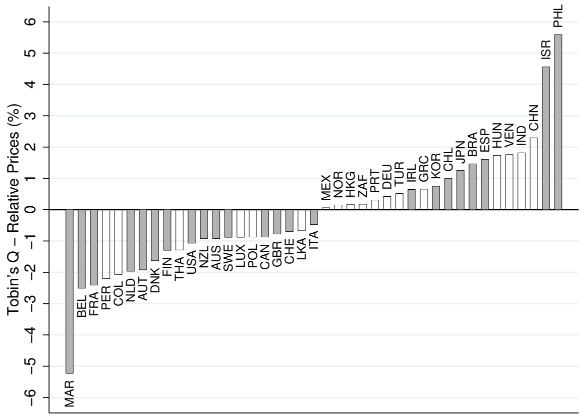
Figure 5: Country-specific Correlations of our Variables of Interest



(a) Labor Income Share - Tobin's Q



(b) Labor Income Share - Relative Prices



(c) Tobin's Q - Relative Prices

Notes: Own calculations obtained from $\ln(Y_t) = \alpha_0 + \alpha_1 \ln(X_t) + \epsilon_t$, where Y represents the labor share or Tobin's Q, X stands for Tobin's Q or the relative prices, and ϵ is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level. The coverage is presented in Table B1 (915 observations, 41 countries).

and (ii) the empirical tools which allow us to infer a causal relationship.

4.1 Empirical Implementation

For empirical purposes, we do not impose a specific production function and, therefore, we do not restrict the functional form of the labor share to be the one derived from a CES technology. We simply assume a general multiplicative form where changes in the capital-output ratio have an impact on the labor share:

$$LIS = g\left(\frac{k}{y}\right) = a\left(\frac{k}{y}\right)^{\alpha} \tag{15}$$

In this way, our empirical specification is comparable to Bentolila and Saint-Paul (2003).

Note that we remain agnostic about α and then we do not know ex-ante whether the impact of $\frac{k}{y}$ on the labor share would be positive or negative. Nevertheless, contrary to Bentolila and Saint-Paul (2003), we further endogenize the capital-output ratio. Our model shows that the equilibrium capital-output ratio depends, among other things, on Tobin's Q, and that the sign of this relation is negative. However, and again for empirical purposes, we do not impose a particular relation derived from the specifics of the model. Rather, we also assume a generic multiplicative form where the capital-output ratio is expressed as a function of Tobin's Q. Following Karabarbounis and Neiman (2014), we also include the relative price of investment goods (RP) as an argument of $\frac{k}{y}$.

$$\frac{k}{y} = f(Q, RP) = Q^{\psi_1} RP^{\psi_2} \tag{16}$$

We use these two forms to obtain an estimable equation of the labor share in terms of Q and RP:

$$LIS = g\left(\frac{k}{y}\right) = g(f(Q, RP)) = a(Q^{\psi_1} RP^{\psi_2})^{\alpha} \tag{17}$$

Taking natural logarithms:

$$\ln(LIS) = \ln(a) + \alpha\psi_1 \ln(Q) + \alpha\psi_2 \ln(RP) + \Omega_{it}, \tag{18}$$

or simplifying:

$$lis_{it} = \beta_0 + \beta_1 q_{it} + \beta_2 rp_{it} + \Omega_{it} \tag{19}$$

Where lis, q, and rp are the natural logarithm values of our variables of interest, and Ω is a standard disturbance term. Note that according to proposition 1 and lemma (1) we expect β_1 to be negative. The sign of β_2 is expected to be negative if, as assumed in the model, σ is lower than one and capital and labor are complements. In that case, an increase in the relative price of capital goods depresses investment and this impacts negatively the labor share. However, if we follow Karabarbounis and Neiman (2014), we should expect β_2 to be positive because a decrease in the price of capital induce firms to shift away from labor towards capital, driving the labor share down.

4.2 Econometric Methodology

Characterized by a small number of cross-sectional units (N) compared to the time dimension (T), macroeconomics panel data have been traditionally estimated following microeconomics panel data techniques under the assumptions of parameter homogeneity (across countries), common impact of unobservable factors, cross-section independence, and data stationarity.[29] However, if these assumptions are violated, results would be subject to misspecification problems. In order to overcome these potential sources of misspecification, we rely on recently developed panel data techniques (panel time-series), which are especially developed for macroeconomics data characteristics (Pesaran, 2015).[30]

Our empirical framework is based on a common factor model (for details, see Eberhardt and Teal, 2011, 2013a,b). Formally, assuming for simplicity an one-input model, a common factor model takes the following form:

$$y_{it} = \beta_i x_{it} + u_{it}, \qquad u_{it} = \varphi_i f_t + \psi_i + \varepsilon_{it}, \tag{20}$$

$$x_{it} = \delta_i f_t + \gamma_i g_t + \pi_i + e_{it}, \tag{21}$$

$$f_t = \tau + \phi f_{t-1} + \omega_t, \qquad g_t = \mu + \kappa g_{t-1} + \nu_t, \tag{22}$$

where y_{it} and x_{it} represent, respectively, the dependent and independent variables, β_i represents the country-specific impact of the regressor on the dependent variable, and u_{it}, aside from the error term (ε_{it}), contains unobservable factors. In particular, it captures unobservable time-invariant heterogeneity through a country fixed effect (ψ_i), while time-variant heterogeneity is accounted for through a common factor (f_t) with country-specific factor loadings (φ_i). At the same time, the model allows for the regressor to be affected by these or other common factors (f_t and g_t). These factors refer to both unobservable global shocks that affect all the countries, although with different intensities (e.g. oil prices or financial crisis), and local spillovers (Chudik et al., 2011; Eberhardt et al., 2013). The presence of the same unobservable process (f_t) as a determinant of both the independent and the dependent variable raise endogeneity problems which make difficult the estimation of β_i (Kapetanios et al., 2011).[31]

We can see the previous common factor model as a general empirical framework which encompasses several simpler structures. In particular, we can classify the estimators within two main types: "Homogeneous estimators" where the impact of the regressor on the dependent variable is constrained to be the same across countries (i.e. $\beta_i = \beta \ \forall \ i$), and "Heterogeneous/Mean group estimators" where a coefficient is estimated for each country

[29]See Roodman (2009) for a detailed explanation on the potential risks of the popular Difference and System GMM estimators.

[30]Although empirical applications of these methods are still not widespread in the literature, it is worthy to acknowledge the valuable contribution made to the field by Markus Eberhardt and coauthors in the last years. The empirical methodology of this manuscript relies on several of their papers.

[31]Equation (22) models these factors as a simple AR(1) where no constrains are imposed to get stationary processes. Note that nonstationarity could provoke a spurious relationship between our variables of interest. If our variables are nonstationary, we have to analyze the cointegration relationship among them to infer any causal relationship.

and the aggregate parameter can be defined as the average of the country-specific coefficients ($\beta^* = N^{-1} \sum_{i=1}^{N} \beta_i$).[32]

Within each group, the assumptions about the structure of the unobservable factors leads to different estimation methods. For the case of the homogeneous estimators, we consider the common Pooled Ordinary Least Square (POLS), the Two-way Fixed Effects (2FE), and the Pooled Common Correlated Effects (CCEP) estimators. While the first two are standard in the literature and account for unobservable heterogeneity through time and country dummies, the CCEP estimator has a more flexible structure, which allows for a different impact of the unobserved factors across countries and time.[33] Empirically, it aims to eliminate the cross-sectional dependence by augmenting equation (19) with the cross-section averages of the variables.[34]

With respect to the heterogeneous models, we consider different mean group estimators. In particular, we present the results for the Pesaran and Smith (1995) Mean Group estimator (MG), the Pesaran (2006) Common Correlated Effects Mean Group estimator (CMG), and the Chudik and Pesaran (2015) Dynamic CMG estimator (CMG2).

Pesaran and Smith (1995) Mean Group estimator (MG) allows for a country-specific impact of both the regressor and the unobservable heterogeneity. The impact of the latter is assumed to be constant, and is empirically accounted by adding country-specific linear trends (t). Therefore, the estimable equation takes the form:

$$lis_{it} = \beta_0^{MG} + \beta_1^{MG} q_{it} + \beta_2^{MG} rp_{it} + \beta_3^{MG} t + \Omega_{it} \tag{23}$$

where $\beta_j^{MG} = N^{-1} \sum_{i=1}^{N} \beta_{ji}$. As explained before, the MG estimator is computed as the simple average of the different country-specific coefficients, which are calculated by regressing the previous equation for each country. However, although it overcomes the potential misspecification from assuming parameter homogeneity, the introduction of country-specific linear trends might not account for all the possible cross-section dependence from the unobserved heterogeneity.

To circumvent this concern, Pesaran (2006) proposes the Common Correlated Effects

[32] Pesaran and Smith (1995) show that the mean group estimators produce consistent estimates of the average of the parameters. These estimators also allows for the use of weights to calculate the average.

[33] POLS and 2FE estimators assume that the time-varying heterogeneity has the same impact across countries for a given year.

[34] Eberhardt et al. (2013) provide the intuition behind this mechanism.

Mean Group estimator (CMG), which is a combination of the MG and the CCEP estimators. In particular, it approximates the unobserved factors by adding the cross-section averages of the dependent and explanatory variables, and then running standard regressions augmented with these cross-section averages. The estimable equation takes the following form:

$$\begin{aligned} lis_{it} &= \beta_0^{CMG} + \beta_1^{CMG} q_{it} + \beta_2^{CMG} rp_{it} \\ &+ \beta_3^{CMG} \overline{lis_t} + \beta_4^{CMG} \overline{q_t} + \beta_5^{CMG} \overline{rp_t} + \Omega_{it}, \end{aligned} \tag{24}$$

where $\beta_j^{CMG} = N^{-1} \sum_{i=1}^{N} \beta_{ji}$. It is easy to see that the first line is the Pesaran and Smith (1995) MG estimator (without linear trend), and the second line is the way the Pesaran (2006) CMG estimator approximates the unobservable processes.

So far, we have discussed how to deal with sources of misspecification arising from parameter homogeneity and the existence of cross-section dependence. This paper also deals with the potential misspecification following from a possible dynamic structure of the relation under study by estimating both static and dynamic specifications. Although Pesaran (2006) CMG estimator yields consistent estimates under a variety of situations (see Kapetanios et al., 2011; Chudik et al., 2011), it does not cover the case of dynamic panels or weakly exogenous regressors. Chudik and Pesaran (2015) propose an extension of the CMG approach (CMG2) to account for the potential problems arising from dynamic panels. In particular, they prove that the inclusion of extra lags of the cross-section averages in the CMG approach delivers a consistent estimator of both β_i and β^{CMG}. Empirically, we proceed by using an Error Correction Model of the following form:

$$\begin{aligned} \Delta lis_{it} &= \beta_0^{CMG2} + \beta_1^{CMG2} lis_{i,t-1} + \beta_2^{CMG2} q_{i,t-1} + \beta_3^{CMG2} rp_{i,t-1} + \beta_4^{CMG2} \Delta q_{it} + \beta_5^{CMG2} \Delta rp_{it} \\ &+ \beta_6^{CMG2} \overline{\Delta lis_t} + \beta_7^{CMG2} \overline{lis_{t-1}} + \beta_8^{CMG2} \overline{q_{t-1}} + \beta_9^{CMG2} \overline{rp_{t-1}} + \beta_{10}^{CMG2} \overline{\Delta q_t} + \beta_{11}^{CMG2} \overline{\Delta rp_t} \\ &+ \sum_{l=1}^{p} \beta_{12}^{CMG2} \overline{\Delta lis_{t-p}} + \sum_{l=1}^{p} \beta_{13}^{CMG2} \overline{\Delta q_{t-p}} + \sum_{l=1}^{p} \beta_{14}^{CMG2} \overline{\Delta rp_{t-p}} + \Omega_{it}, \end{aligned} \tag{25}$$

where the first line represents the Pesaran and Smith (1995) MG estimator, the inclusion of the second gives the Pesaran (2006) CMG estimator, and the three lines together are the Chudik and Pesaran (2015) Dynamic CMG estimator (CMG2).[35]

Likewise, given the way they control for unobservables, CMG style estimators are suitable for accounting for structural breaks and business cycle distortions, thus making the use of yearly data perfectly valid in order to infer long-run relationships.

[35] Chudik and Pesaran (2015) recommend to set the number of lags equal to $T^{1/3}$. We consider up to 2 extra lags of the cross-section averages.

5 Results

This section begins by showing the results of a baseline model (subsection 5.1), where Tobin's Q is the only regressor. Subection 5.2 further includes the relative price of investment in the analysis. Subsection 5.3 provides evidence supporting the interpretation of our results as a causal relationship, and finally, subection 5.4 presents a robustness check of our results.[36]

5.1 Baseline Results

Tables 1 and 2 present the results for our baseline model, where only the impact of Tobin's Q on the labor income share is considered. Columns [1]-[4] display the homogeneous-type estimators, where β is constrained to be the same across countries. We present results for the standard OLS estimator with time-dummies (POLS), the 2FE estimator and the CCEP estimator, with and without including a country-specific linear trend. Columns [5]-[7] present the heterogeneous-type estimators. In particular, we show the estimates for the MG, and the CMG estimator with and without country-specific trends. As commented before, we estimate country-specific regressions, and the estimator presented is the average of the country-specific coefficients.

Table 1 presents the estimates corresponding to a static model including 41 countries for a total of 915 observations.[37] Concerning the homogeneous-type estimators, we find a negative and significant impact of Tobin's Q on the labor income share in all but the POLS estimator (where the impact is positive and significant). However, the cross-sectional augmented panel unit root (CIPS) Pesaran (2007) test and the Pesaran (2004) CD test for cross-section dependence indicate that the residuals suffer from nonstationarity and cross-section depedence.[38] That is to say, [1] to [4] regressions are suffering from some type of misspecification, which from our discussion before could be: (i) the imposition of parameter homogeneity, (ii) an unsuitable structure of the unobservable heterogeneity, or (iii) that the nature of the relationship is not static. The relevance of the first two potential sources of misspecification can be tested analyzing the mean group estimators

[36] Appendix D presents an exhaustive analysis of the time-series properties of our variables of interest. The presence of nonstationary variables and cross-section dependence in our data make the use of traditional panel data techniques invalid. To be sure that our regression results are not subject to biases due to cross-section dependence or to spurious relationships due to the order of integration, we will pay specially attention to regression residuals' characteristics. In particular, in our preferred specification residuals are stationary (which is an informal test for cointegration among the variables) and they do not have problems of cross-section dependence (which indicates that our specification succesfully capture the unobservable heterogeneities).

[37] Table B1 in Appendix B shows the specific countries and period under analysis.

[38] See Appendix D for a detailed explanation of these tests.

(columns [5]-[7]). A negative and significant impact of Tobin's Q on the labor income share is still present, ranging from -0.053 to -0.06. However, although the residuals present an improvement in terms of absolute correlation, we still observe cross-section dependence. Stationarity in the residuals is now present in 2 out of the 3 regressions. These results suggest that, although the introduction of parameter heterogeneity improves the specification, it is not enough to solve all the potential misspecification problems.

Table 2 analyzes the third potential source of misspecification through the estimation of a Partial Adjustment Model (PAM), where the first lag of the dependent variable is included as a regressor. Due to data limitations, we consider 40 countries with the number of observations ranging from 850 to 885. The first important result is that a clear negative and significant long-run relationship is observed between Tobin's Q and the labor share irrespective of the estimator used for the analysis analysis. The second remarkable fact is that most of the residuals show cross-sectional independence and stationarity, indicating the absence of the previous source of misspecification. Given its flexibility in controlling for the unobserved factors, our preferred model is the one showed in the last column (CMGt2)) which corresponds to the Chudik and Pesaran (2015) Dynamic CMG estimator, where 2 extra lags of the cross-section averages are included in the regression to control for the potential dynamic bias. Our findings suggest that a 1% increase in Tobin's Q causes a decrease in the labor income share of 0.08% in the long-run.

5.2 The Effect of the Relative Price of Investment Goods

As commented before, Karabarbounis and Neiman (2014) have argued that the global decline in the labor share can be explained, at least partially, by the decrease in the relative price of investment goods. They estimate that the lower price of investment goods explains roughly half of the observed decline in the labor share. In this section we test their hypothesis by including the relative price of investment goods in our regressions and compare their mechanism with our Tobin's Q channel. Tables 3 and 4 show the results.

Table 3 displays the results from the static model. The inclusion of the relative price of investment does not alter the negative relationship found between Tobin's Q and the labor share. With respect to their effect, they present a negative impact under the homogeneous-type estimators. However, once we allow for parameter heterogeneity, they no longer show any kind of influence on the labor income share. Nevertheless, similar to the static model analyzed in Table 1, residuals show cross-section dependence and nonstationarity.

In order to address concerns arising from the dynamic structure of our equation, we esti-

Table 1: Static Baseline Model

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt
q	0.14	-0.083	-0.05	-0.052	-0.057	-0.053	-0.06
	(0.052)***	(0.025)***	(0.017)***	(0.016)***	(0.015)***	(0.020)***	(0.016)***
t					-0.003		-0.003
					(0.001)**		(0.001)**
Constant	-0.647	-0.665			-0.656	-0.483	-0.714
	(0.036)***	(0.017)***			(0.032)***	(0.068)***	(0.105)***
Number Id	41	41	41	41	41	41	41
Observations	915	915	915	915	915	915	915
R-squared	0.11	0.93	0.99	0.99			
RMSE	0.2244	0.0629	0.0500	0.0474	0.0443	0.0435	0.0336
Trend					0.73		0.59
CD test	28.3495	-2.6979	8.688	-2.9706	3.8019	9.5781	5.4416
Abs Corr	0.4730	0.4211	0.3710	0.3660	0.3052	0.3243	0.2658
Int	I(1)	I(1)	I(0)/I(1)	I(1)	I(1)	I(1)/I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends.
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%.

Table 2: Dynamic Baseline Model

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt	[8] CMGt1	[9] CMGt2
q	-0.009	-0.03	-0.021	-0.023	-0.034	-0.017	-0.024	-0.026	-0.04
	(0.015)	(0.019)	(0.012)*	(0.012)*	(0.010)***	(0.011)	(0.012)**	(0.013)**	(0.010)***
lis_{t-1}	0.977	0.771	0.749	0.718	0.64	0.767	0.608	0.537	0.502
	(0.008)***	(0.078)***	(0.037)***	(0.041)***	(0.034)***	(0.026)***	(0.032)***	(0.037)***	(0.048)***
t					-0.001		-0.001	-0.001	-0.001
					(0.000)		(0.001)*	(0.001)	(0.001)*
Constant	-0.005	-0.141			-0.232	-0.135	-0.358	-0.418	-0.318
	(0.009)	(0.051)***			(0.025)***	(0.026)***	(0.076)***	(0.084)***	(0.078)***
Number of id	40	40	40	40	40	40	40	40	40
Observations	885	885	885	885	885	885	885	868	850
R-squared	0.97	0.98	0.99	0.99					
RMSE	0.0403	0.0384	0.0307	0.0309	0.0338	0.0246	0.0225	0.0202	0.0178
Trend					0.25		0.30	0.33	0.23
lr-q	-0.4112	-0.1288	-0.0854	-0.0815	-0.0944	-0.0725	-0.061	-0.0564	-0.08
se-q	0.7248	0.0613	0.0466	0.0428	0.0296	0.0462	0.0306	0.0281	0.0208
CD test	-0.2311	-1.2989	-0.9679	-2.5497	8.5344	-1.3683	-1.1636	-0.4342	-0.5145
Abs Corr	0.2133	0.2253	0.2309	0.2339	0.2240	0.2171	0.2188	0.2331	0.2426
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends, CMGt1 and CMGt2 = CMGt with, respectively, one and two extra cross-sectional averages lags, as indicated by Chudik and Pesaran (2015).
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%. lr-q and se-q represent respectively q's long-run impact and its standard error.

Table 3: Static Model with Relative Prices

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt
q	0.157	-0.08	-0.052	-0.052	-0.067	-0.061	-0.052
	(0.051)***	(0.025)***	(0.015)***	(0.015)***	(0.013)***	(0.019)***	(0.015)***
rp	-0.344	-0.113	-0.1	-0.101	0.005	-0.001	0.017
	(0.100)***	(0.043)***	(0.048)**	(0.047)**	(0.085)	(0.111)	(0.078)
t					-0.002		-0.002
					(0.001)*		(0.002)
Constant	-0.589	-0.642			-0.678	-0.681	-0.664
	(0.039)***	(0.019)***			(0.034)***	(0.101)***	(0.078)***
Number of id	41	41	41	41	41	41	41
Observations	915	915	915	915	915	915	915
R-squared	0.12	0.93	0.99	0.99			
RMSE	0.2229	0.0625	0.0411	0.0399	0.0405	0.0311	0.0273
Trend					0.56		0.32
CD test	25.6361	-2.4791	5.4335	-2.3717	3.7041	2.4645	4.6826
Abs Corr	0.4506	0.4142	0.3057	0.3102	0.2821	0.2522	0.2517
Int	I(1)	I(1)	I(0)/I(1)	I(0)/I(1)	I(0)/I(1)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends.
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%.

Table 4: ECM with Relative Prices

	[1] 2FE	[2] CCEP	[3] MG	[4] CMG	[5] CMGt	[6] CMGt1	[7] CMGt2
lis_{t-1}	-0.176	-0.365	-0.449	-0.5	-0.694	-0.72	-0.812
	(0.026)***	(0.049)***	(0.034)***	(0.053)***	(0.061)***	(0.085)***	(0.125)***
q_{t-1}	0.011	-0.005	-0.035	-0.039	-0.067	-0.076	-0.058
	(0.013)	(0.016)	(0.014)**	(0.018)**	(0.026)**	(0.028)***	(0.033)*
rp_{t-1}	-0.032	0.034	0.064	0.15	0.092	0.129	-0.005
	(0.024)	(0.047)	(0.070)	(0.091)*	(0.115)	(0.166)	(0.186)
Δq	-0.031	-0.030	-0.038	-0.038	-0.051	-0.053	-0.058
	(0.014)**	(0.014)**	(0.009)***	(0.012)***	(0.017)***	(0.019)***	(0.018)***
Δrp	-0.141	-0.153	-0.021	0.049	0.093	0.05	-0.11
	(0.050)***	(0.068)***	(0.065)	(0.108)	(0.099)	(0.107)	(0.095)
t			0.001		0.001	0.001	0.001
			(0.001)		(0.002)	(0.003)	(0.004)
Constant	-0.106		-0.301	-0.273	-0.277	-0.431	-0.356
	(0.018)***		(0.033)***	(0.050)***	(0.084)***	(0.089)***	(0.124)***
Number of id	30	30	30	30	30	29	26
Observations	732	732	732	732	732	700	631
R-squared	0.26	0.57					
RMSE	0.0264	0.0228	0.0191	0.0142	0.0127	0.0101	0.0067
Trend			0.23		0.20	0.21	0.23
lr-q	0.0621	-0.0136	-0.0779	-0.0785	-0.0965	-0.1061	-0.0718
se-q	0.0739	0.0428	0.0327	0.0374	0.0388	0.0405	0.0422
lr-rp	-0.1826	0.0927	0.1417	0.2999	0.1325	0.1796	-0.0063
se-rp	0.1306	0.1295	0.1573	0.185	0.1661	0.2312	0.2285
CD test	-2.4749	-2.0278	4.9547	-0.4678	0.0134	1.0079	1.3218
Abs Corr	0.1884	0.2114	0.2038	0.2170	0.2189	0.2393	0.2466
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends, CMGt1 and CMGt2 = CMGt with, respectively, one and two extra cross-sectional averages lags, as indicated by Chudik and Pesaran (2015).
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%. lr-q and se-q represent respectively q's long-run impact and its standard error. lr-rp and se-rp represent respectively rp's long-run impact and its standard error.

mate an Error Correction Model (Table 4), where due to data restrictions we are not able to include more than 30 countries. Although we present the results for different estimators, we focus especially on the CMG-style estimators (columns [4]-[7]), which allow for a higher degree of flexibility. The first remarkable fact is the presence of stationarity and cross-section independence of the residuals, which indicates the absence of the previous misspecification problems. Regarding the impact of our variables of interest, we observe a negative impact of Tobin's Q in both the short and long-run. If we focus on the long-run relationship, our estimations imply that an increase of 1% in Tobin's Q would decrease the labor income share by between 0.072% and 0.11%. However, we do not find empirical support for the effect of relative prices. These findings support our theoretical model, and, like Chirinko and Mallick (2017), cast doubts on the decline of investment goods prices as a driver of the labor income share.

To grasp the magnitude of these results, we can consider that, since the GDP-weighted average Tobin's Q in our sample has increased from a value of 1.15 in 1980 to a value of 1.68 in 2007 (46%), and since the labor income share has evolved from a value of 57% to 52% (-8.9%), our estimates imply that the increase in Tobin's Q could explain between 41% and 57% of the labor income share decline.

5.3 Weak Exogeneity Test

Our analysis has dealt with the presence of endogeneity from common factors driving both inputs and output. However, it is not uncommon in macroeconomics to suffer from endogeneity due to a reverse causality problem.[39]

Traditionally, the literature has used instrumental variable methods to circumvent this issue. However, given the nature of our data, providing a valid set of instruments is challenging (i.e. variables which are correlated with the regressor but not with the error term).[40] Therefore, provided that our series are nonstationary and cointegrated, we follow Canning and Pedroni (2008); and Eberhardt and Presbitero (2015) to estimate an informal causality test based on the Granger Representation Theorem (GRT). The GRT (Engle and Granger, 1987) states that cointegrated series can be represented in the form of an ECM, which in our case is:

[39] In our case, reverse causality implies that besides the relative prices and Tobin's Q affecting the labor income share, the labor income share has in turn, a significant impact on their values.

[40] Under the presence of unobservable common factors and parameter heterogeneity, the use of internal instruments (lags of the variables) is not valid anymore.

$$\Delta lis_{it} = \alpha_{1i} + \lambda_{11i}\hat{u}_{i,t-j} + \sum_{j=1}^{k}\phi_{11ij}lis_{i,t-j} + \sum_{j=1}^{k}\phi_{12ij}q_{i,t-j}\sum_{j=1}^{k}\phi_{13ij}rp_{i,t-j} + \epsilon_{1it}, \quad (26)$$

$$\Delta q_{it} = \alpha_{2i} + \lambda_{21i}\hat{u}_{i,t-j} + \sum_{j=1}^{k}\phi_{21ij}lis_{i,t-j} + \sum_{j=1}^{k}\phi_{22ij}q_{i,t-j}\sum_{j=1}^{k}\phi_{23ij}rp_{i,t-j} + \epsilon_{2it}, \quad (27)$$

$$\Delta rp_{it} = \alpha_{3i} + \lambda_{31i}\hat{u}_{i,t-j} + \sum_{j=1}^{k}\phi_{31ij}lis_{i,t-j} + \sum_{j=1}^{k}\phi_{32ij}q_{i,t-j}\sum_{j=1}^{k}\phi_{33ij}rp_{i,t-j} + \epsilon_{3it}, \quad (28)$$

where $\hat{u}_{it} = lis_{it} - \hat{\beta}_{1i}q_{it} + \hat{\beta}_{2i}rp_{it}$ is the disequilibrium term. In order to identify a long-run equilibrium relationship, the GRT requires at least one of the λ's to be nonzero. If $\lambda_{11} \neq 0$, q and rp have a causal impact on the lis, if λ_{11}, λ_{21}, and λ_{31} are nonzero, then all variables are determined simultaneously, and no causal relationship can be identified.

Table 5: Weak Exogeneity Test

		no CA			CA		
Model		lis	q	rp	lis	q	rp
MG	Avg. λ	-0.52	-0.45	0.02	-0.50	-0.41	-0.04
	ρ	0.00	0.03*	0.48	0.00	0.21	0.60
CMG	Avg. λ	-0.57	-0.40	-0.01	-0.51	-0.54	0.00
	ρ	0.00	0.15	0.83	0.00	0.18	0.94
CMGt	Avg. λ	-0.75	-0.65	0.00	-0.69	-0.74	-0.04
	ρ	0.00	0.01*	0.98	0.00	0.12	0.72
CMG1	Avg. λ	-0.59	-0.23	0.04	-0.51	-0.58	0.03
	ρ	0.00	0.52	0.24	0.00	0.13	0.61
CMGt1	Avg. λ	-0.77	-0.12	0.06	-0.75	-0.60	0.05
	ρ	0.00	0.75	0.19	0.00	0.19	0.38
CMG2	Avg. λ	-0.73	-0.42	-0.07	-0.64	-1.04	-0.05
	ρ	0.00	0.32	0.09*	0.00	0.04*	0.56
CMGt2	Avg. λ	-0.93	-0.46	0.06	-0.82	-1.20	0.05
	ρ	0.00	0.29	0.25	0.00	0.01*	0.44

Notes: Avg. λ shows the robust mean coefficient for the disequilibrium term on the ECM. Asterisks highlight cases which do not support a causality relationship for our analysis.

Table 5 presents the results for our weak exogeneity test. Column labeled as "Model" refers to the method used to estimate the disequilibrium term ($\hat{u}$). The two big blocks "CA" and "no CA" indicate whether equations (26)-(28) include, or not, cross-sectional averages of the variables. Within each block, the dependent variable of the system is specified at the top of the column. The information provided shows the results for the average λ and its respective p-value. As already commented, for a causal effect of Tobin's Q and the relative prices on the labor share, λ_{11} should be different from 0, while $\lambda_{21} = \lambda_{31} = 0$. We find that just 5 out of 42 cases (highlighted with asterisks) are against the argument of a causal relationship. Therefore, our results can be safely interpreted as the causal impact of Tobin's Q and the relative price of investment on the labor income share.

5.4 Robustness

Our study supports the argument of a long-run negative impact of Tobin's Q on the labor share. In this subsection we prove the robustness of the results presented in Tables 1-4 to an alternative definition of Q. More specifically, in Tables B4-B7 in Appendix B Tobin's Q is defined as the Corporate Wealth Tobin's Q obtained from the World Wealth & Income database instead of our computed Q.

By doing so, the sample of countries included in the analysis decreases to 9, for a maximum of 208 observations.[41] Despite of this, we prove that the negative relationship between the labor share and Q found in Section 5 is unchanged and robust independently of the functional form of the empirical equation and of the variables included (i.e. static vs dynamic, with-without relative prices). Specifically, the new set of results shows that a Tobin's Q increase of one percent decreases the labor income share by around 0.10% in the long-run.[42]

6 Beyond the Q: Empirical Evidence

This section aims to provide some empirical evidence on the relationship between Tobin's Q and the determinants highlighted in the section 2.4: dividend income taxes, firms market power and corporate governance. More specifically, Section 6.1 connects the evolution of the dividend income tax rates during the last decades with the trends followed by Tobin's Q and the capital-output ratios. Section 6.2 studies the relationship between the last two variables and changes in the degree of market power using both cross-country and U.S. industry-level data. Finally, Section 6.3 does an analogous analysis for the impact of changes in corporate governance using both country and U.S. firm-level data.

[41] Australia, Canada, Denmark, France, Germany, Japan, Netherlands, United Kingdom, and the United States.

[42] Given the small number of countries included in the analysis, it is not surprising that the CD-test rejects the null of cross-section independence in some regressions.

6.1 Dividend Income Tax Rate

Our theoretical framework predicts that a decline in the dividend income tax should increase equity Tobin's Q, putting downward pressure on the capital-output ratio.[43]

We check the validity of this mechanism by relating dividend income tax trends with the pattern followed by Tobin's Q and the capital-output ratio. The sample is restricted to a subset of countries due to data availability.[44] Most of the countries in the sample have experienced, on average, declines in the dividend tax rate of around 1 percentage point per year, with countries such as Japan and Italy reaching levels of around 2 percentage points per year during the period under analysis (see figure B4 in the Appendix).

Figure 6 presents the coefficients (in %) of the following country-specific OLS regressions:

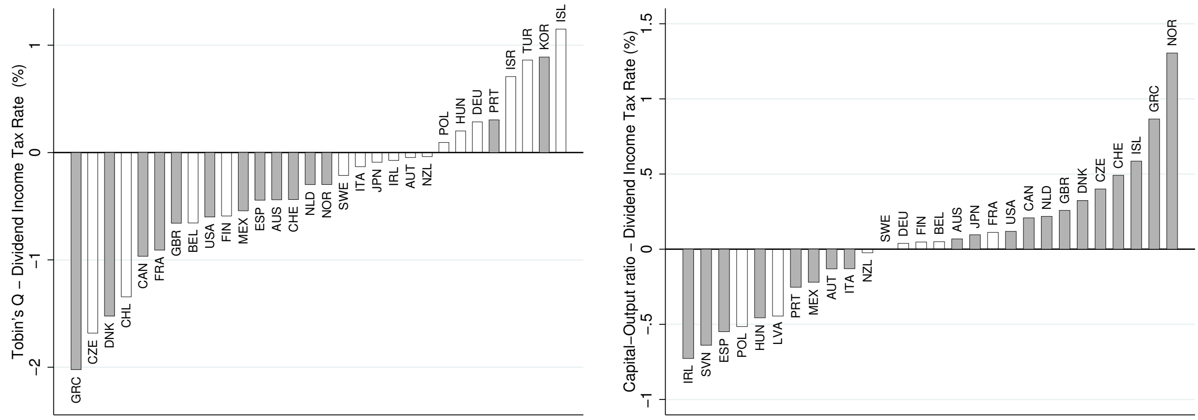
$$\ln(X_t) = \alpha_0 + \alpha_1 TAX_t + \epsilon_t, \tag{29}$$

where X, depending on the specification, represents Q or the capital-output ratio, TAX stands for the dividend income tax rate, and ϵ is a classical disturbance term. Figure 6.a shows that most countries present the expected negative correlation between Q and the dividend income tax rate. Only in two countries (Korea and Portugal) α_1 is positive and significantly different from 0 at 5% level. Figure 6.b presents the corresponding results relative to the capital-output ratio and the dividend tax. Although most of the countries have a positive coefficient for α_1, the pattern is more heterogeneous.

[43] Anagnostopoulos et al. (2012) use a similar mechanism under perfect competition and incomplete markets.

[44] In particular, we include in our analysis countries that have at least 10 observations for the period 1980-2014. This implies that the sample coverage could be different among the three variables under study. Figure B4 in the appendix shows the country-specific trends for this three variables. Apart from the global rise in Tobin's Q [45] and a heterogeneous capital-output pattern, Figure B4 shows a generalized and strong negative trend in the dividend income tax rate.

Figure 6: Tobins' Q, Capital-Output Ratios and Dividend Income Tax Rates (I)



(a) Tobins' Q (b) Capital-Output ratio

Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 TAX_t + \epsilon_t$, where X represents Tobin's Q or the capital-output ratio, TAX stands for the dividend income tax rate, and ϵ is a classic disturbance term. The vertical axis shows the coefficient α_1 in %. Dark bars indicate that α_1 is significant at 5% level. Each graph shows countries for which we have at least 10 observations for the period under analysis (Max. 1980-2014). Luxembourg is excluded from the graph due to be a clear outlier.

The correlations between our variables of interest and the dividend tax rate presented in Figure 6 are likely to capture also the effect of other unobserved factors affecting both sides of equation (29).[46] In order to further study the validity of the dividend tax mechanism, Figure 7 exploits the cross-country variation by presenting a scatter plot where the vertical axis displays the regression coefficients relating Tobin's Q with the dividend tax rate, and the horizontal axis displays the regression coefficients of the capital-output ratio with respect to the dividend tax rate.[47] We observe a negative relation. This indicates that countries where the capital-output ratio is more sensitive to changes in the dividend tax rate experience a larger decrease in Tobin's Q in response to an increase in this tax rate.[48]

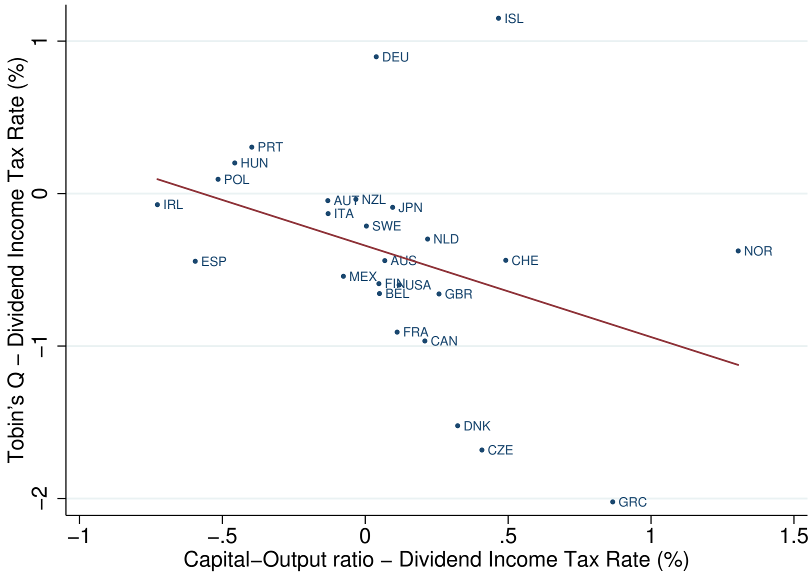
Although it is worthy to remind that the goal of this section is not to claim any causality, the empirical evidence supports the role of the mechanism that emerges from our model.

[46]For example, a new Government in office could implement simultaneously a tax reform and policies which foster capital accumulation, this would cause the patterns observed in Figure 6 without any connection between Q and the capital-output ratio due to the change in taxes.

[47]These coefficients are slightly different than the ones presented in Figure 6. The source of discrepancy is that this time both equations are constrained to include the same sample.

[48]Our results are robust to the inclusion of a dummy variable for the period 2008-2014 and to limit the sample to the pre-crisis period (1980-2008). Robustness exercises are available upon request.

Figure 7: Tobins' Q, Capital-Output Ratios and Dividend Income Tax Rates (II)



Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 TAX_t + \epsilon_t$, where X represents Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. TAX is the dividend income tax rate, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constrained to have the same number of observations (Max. 1980-2014). The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA. Correlation coefficient= -0.38^{**}.

6.2 Market Power

Several recent contributions have emphasized the role of market power in explaining the decline of the labor share (Barkai, 2017; Loecker and Eeckhout, 2017). This literature argues that the increase in markups has widened the difference between the marginal products and the price of factors. (e.g. $F_l(k,l) = \mu w$, with increasing μ). While nesting this transmission mechanism from markups to factors shares, our framework foresees an additional, general equilibrium channel. Our model argues that the capitalization of future market power rents is one of the factors that boosts asset prices and has distributional effects. This mechanism is based on the assumption that the asset demand is upward sloping and is conceptually different to the partial equilibrium effect of current markups. Of course, both mechanisms are complementary, particularly if current markups serve to form expectations about future markups. This subsection explores if different proxies of current market power are consistent with our model, complementing the existing literature on the topic.

Given the difficulty to obtain good proxies for the degree of aggregate market power in different countries, we split this subsection in two parts. In Section 6.2.1 we focus on the specific case of the U.S. by exploiting industry-level variations. Section 6.2.2 expands the analysis at the cross-country level by creating country-specific markups.

6.2.1 The U.S. Industry Concentration Rate

U.S. industry-level data is gathered from three different datasets. Tobin's Q data comes from the Worldscope database, the capital-output ratio is obtained from the NBER-CES Manufacturing Industry database by dividing the total real capital stock over the real value of the shipments, and the degree of market power is proxied by four different measures of industry concentration obtained from the U.S. Economic Census for the years 2002, 2007, and 2012.[49]

Merging the three databases requires various steps. Tobin's Q firm-level data is aggregated at the 4-digit SIC industry level by calculating the median Q of the industry for the years 2002, 2007, and 2012. Data on industry concentration is classified following the NAICS industry classification applied by the U.S. Economic Census. In order to homogenize both samples we transform the NAICS code into SIC codes. More specifically, we first constraint our analysis to industries (6-digit NAICS) that are consistently defined among the 3 census waves used. Similar to Barkai (2017), we further homogenize the NAICS codes to the 1997 year definition using the concordances provided by the census. In order to assign 6-digit NAICS industry codes to 4-digit SIC industry classification, we use the crosswalk file provided by David Dorn, where the transformation is based on the employment weights of NAICS on SIC industries.[50] The NBER-CES Manufacturing Industry database provides data already disaggregated at 4-digit SIC industry classification.[51]

Our study of the relationship between Tobin's Q and the market power includes a maximum of 480 4-digit industries covering 6 large sectors of the economy (Manufacturing, Utilities, Retail Trade, Wholesale Trade, Finance, and Services). Due to the nature of the NBER-CES database, our study is limited to a maximum of 280 4-digit industries within the manufacturing sector where the capital-output ratio is included. Empirically, we estimate:

$$\Delta \ln (X_{it}) = \alpha_0 + \alpha_1 \Delta \ln (ConY_{it}) + \epsilon_{it}, \tag{30}$$

where $\Delta \ln (X_{it})$ represents the 5 year log differences of Tobin's Q or the capital-output

[49] Following Autor et al. (2017) and Barkai (2017) we consider the share of sales of the 4, 8, 20 and 50 largest companies in an industry.

[50] The crosswalk file is available at `http://www.ddorn.net/data.htm`.

[51] The NBER-CES database covers 459 4-digit SIC industries for the period 1958-2011. We match 2011 capital-output values with the 2012 values of Tobin's Q and industry concentration.

ratio, $\Delta \ln(ConY_{it})$ is the 5 year log differences of the share of sales for the 4, 8, 20 and 50 largest companies in the industry, and ϵ_{it} is the classical error term. Subscripts i and t represent, respectively, the cross-section (4-digit SIC industries) and time dimension of the panel.

Table 6 presents the estimates of equation (30) for the four different measures of industry concentration. Columns [1]-[8] display results when the dependent variable is the 5 year log differences of Tobin's Q (Δq). Results for the specification using the 5 year log differences of the capital-output ratio (Δky) are showed in columns [9]-[12].[52]

Table 6: Tobin's Q, Capital-Output Ratio and Industry Concentration

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	Dependent variable: Δq								Dependent variable: Δky			
$\Delta Con4$	0.066 (0.078)				0.087 (0.083)				-0.153 (0.068)**			
$\Delta Con8$		0.088 (0.109)				0.120 (0.118)				-0.172 (0.087)*		
$\Delta Con20$			0.271 (0.126)**				0.332 (0.134)**				-0.160 (0.097)	
$\Delta Con50$				0.340 (0.157)**				0.413 (0.174)**				-0.099 (0.094)
Constant	0.28 (0.031)***	0.28 (0.030)***	0.278 (0.030)***	0.28 (0.031)***	0.315 (0.027)***	0.315 (0.027)***	0.315 (0.027)***	0.317 (0.028)***	-0.079 (0.014)***	-0.082 (0.014)***	-0.083 (0.014)***	-0.083 (0.015)***
R-squared	0.11	0.11	0.12	0.12	0.16	0.16	0.17	0.17	0.26	0.26	0.25	0.25
Observations	834	833	832	825	834	833	832	825	467	467	465	458
SIC4	480	480	480	473	480	480	480	473	280	280	280	273
SIC2	59	59	59	59	59	59	59	59	20	20	20	20
Sectors	6	6	6	6	6	6	6	6	1	1	1	1
Sector FE	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO
SIC2 FE	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors clustered at 2-digit SIC level in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. SIC4 and SIC2 indicate the number of groups included in the regressions classified at the 4 and 2-digit SIC level. Sectors indicates the number of groups included using the broader sector definition.

A positive relationship between industry concentration and Tobin's Q emerges in all the regressions.[53] When industry concentration is proxied by the share of sales of the 20 and 50 largest companies in the industry we find a positive and significant impact implying that a 1 percentage point raise in industry concentration growth rate is associated with

[52]Columns [1]-[4] include fixed effects for the 6 sectors, and columns [5]-[8] include fixed effects for 59 different 2-digit SIC industries. Given that the capital-output ratio is limited to the manufacturing sector, we only included 2-digit SIC industries fixed effects. All regressions control for time fixed effects and the standard errors are clustered at 2-digit SIC industry level. Results are also robust to the inclusion of 3-digit SIC level fixed effects and alternative choices of the level at which errors are clustered. These results are available upon request. For simplicity, in Table 6 $\Delta ConY$ represents the 5 year log differences of the share of sales.

[53]David Autor and coauthors briefly comment the relationship of Tobin's Q with monopoly power (Autor et al., 2017, p.20). In the context of their Superstar firm theory they also argue that a positive relationship should exist. They show that an increase in the industry concentration rate of the largest 20 companies in the industry ($Con20$) it is related to an increase of Tobin's Q of 0.411 (Autor et al., 2017, footnote 32). In the same footnote, using Tobin's Q as a proxy of market power, Autor et al. (2017) also relate the labor share with the Q. The coefficient they find (-0.085) for the U.S. is similar to our estimations.

an increase in Tobin's Q growth rate of between 0.27 and 0.41 pp. This result is robust to the inclusion of fixed effects at the sector level and at 2-digit SIC level. However, when the industry concentration is proxied by the share of the sales of the 4 and 8 largest companies in the industry, although the impact is positive, its magnitude is small and not significantly different from zero at the standard levels. One possible explanation for this disparity has to due with the way we defined Tobin's Q, that is, based on the median company within each 4-digit SIC industry level. While this measure allows us to control for potential outliers, on the other hand it implies that changes in Q are not driven by companies at the top of the distribution, which are likely to be also the ones at the top of the sales distribution.[54]

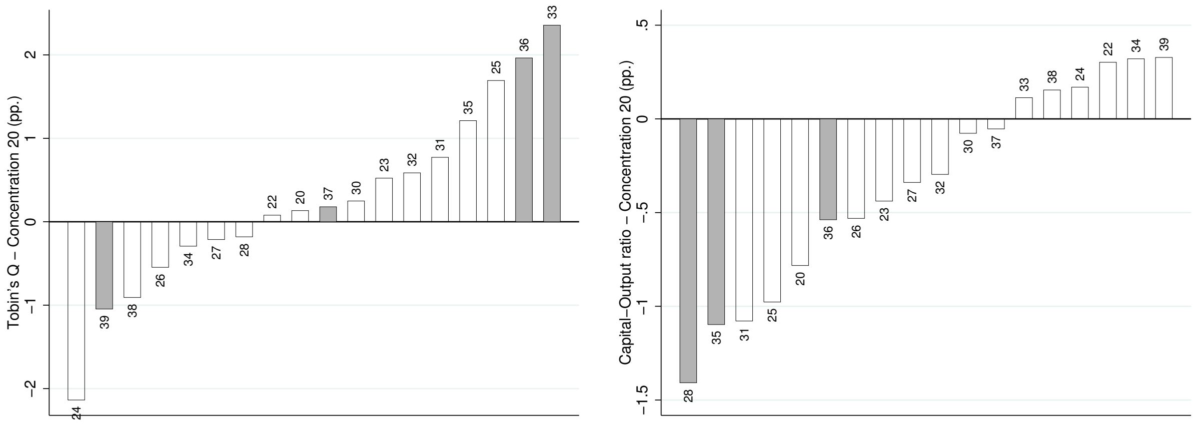
As predicted by our model, columns [9]-[12] report a negative relationship between the growth rate of the capital-output ratio and the growth rate of the market concentration. In this case, the coefficient is more precisely estimated when the industry market power is proxied by the share of sales of the 4 and 8 largest companies. More specifically, we find that an increase of 1 pp. in the industry concentration is associated with a capital-output ratio growth decline of around 0.16 pp.

In order to asses the validity of our model, we follow the same strategy of Section 6.1 for the dividend income tax. Figure 8 presents the correlations between our variables of interest and the share of sales of the largest 20 companies in the industry by displaying the α_1 coefficients (in pp.) of equation (30). Separate regressions are estimated for the different 2-digit SIC manufacturing industries included in our sample. Although the estimates are not precise, Figure 8.a suggests that most of the industries present the expected positive correlation between Q and the proxy of market power. On the other hand, Figure 8.b shows the corresponding results with respect to the industry concentration indicator and the capital-output ratio. Consistent with the results of Table 6, most industries display a negative correlation between these two variables.[55]

[54]In order to check this possibility, we rerun regressions [1]-[8] when Tobin's Q is calculated as the industry average. Although under some assumptions (i.e. minimum number of companies in the industry, cap the Q at different values...) the concentration indicator for the 4 and 8 largest companies become more relevant, it remains nonsignificant in a non-negligible number of cases.

[55]Our sample includes industries containing at least 5 observations. On average we have 26 observations per 2-digit SIC industry when the dependent variable is Δq, and 25 for Δky.

Figure 8: Tobins' Q, Capital-Output Ratios and Industry Concentration (I)



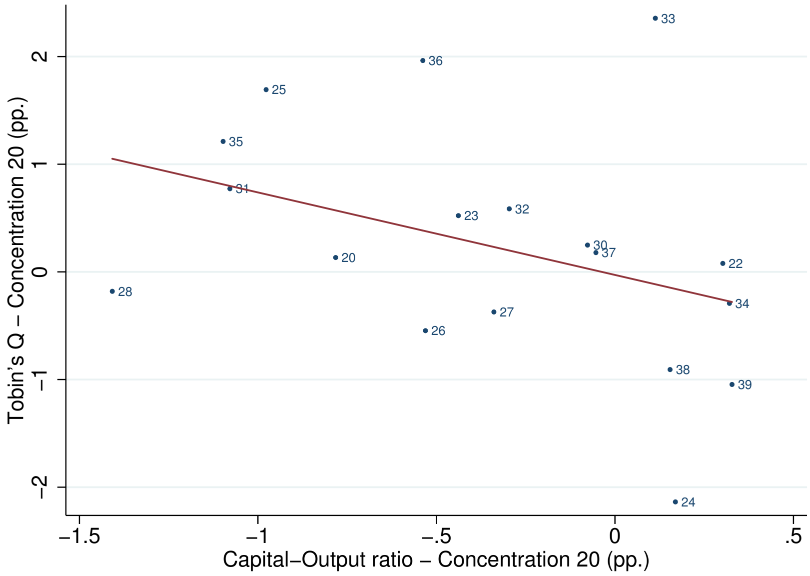
(a) Tobins' Q (b) Capital-Output ratio

Notes: Own calculations obtained from $\Delta \ln (X_{it}) = \alpha_0 + \alpha_1 \Delta \ln (ConY_{it}) + \epsilon_{it},$, where X represents Tobin's Q and the capital-output ratio, $Con20$ is the share of sales of the 20 largest companies in the industry, and ϵ is a classic disturbance term. The vertical axis shows the coefficient α_1 in pp. Dark bars indicate that α_1 is significant at 5% level. Each graph shows SIC 2 industries for which we have at least 5 observations.

Figure 9 further exploits the 2-digit cross-industry variation by presenting a scatter plot where the vertical axis displays the coefficients of a regression of Tobin's Q on the industry concentration rate, and the horizontal axis displays the coefficients of a regression of the capital-output ratio on the industry concentration rate.[56] Altogether, we find evidence supporting the market power mechanism highlighted in our model. More specifically, Figure 9 shows a negative relationship, which indicates that industries where Tobin's Q raises the most when the industry concentration rate increases are those where the capital-output decreases the most in response to that change in market concentration.

[56] As in the tax exercise, these coefficients are slightly different than the ones presented in Figure 8. The source of discrepancy is that this time both equations are constrained to include the same sample.

Figure 9: Tobins' Q, Capital-Output Ratios and Industry Concentration (II)



Notes: Own calculations obtained from $\Delta \ln (X_{it}) = \alpha_0 + \alpha_1 \Delta \ln (Con20_{it}) + \epsilon_{it}$, where X represents Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. $Con20$ is the share of sales of the 20 largest companies in the industry, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in pp. Both equations are constrained to have the same number of observations. The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA. Correlation coefficient= -0.38.

6.2.2 International Markups

To show cross-country evidence between our variables of interest and the level of market power, we calculate international markups. We follow Karabarbounis and Neiman (2014) closely.[57] The markup μ is defined as:

$$\mu = \frac{1}{1 - S_\Pi} = \frac{1}{S_L + S_K}, \tag{31}$$

where S_Π, S_L, and S_K are respectively the profit, labor, and capital shares. While the labor share is obtained straightforward, the capital share is defined as (see equation (20) in Karabarbounis and Neiman, 2014):

$$S_K = \frac{RK}{Y} = \left(\frac{\xi X}{Y}\right)\left(\frac{\frac{1}{\beta} - 1 + \delta}{\delta}\right), \tag{32}$$

where R is the capital rental rate, K is the stock of capital, and Y is the gross domestic product. The first term in the right hand side is composed by the product of the relative price of investment (ξ) and the gross capital formation (X). Empirically this term is prox-

[57] See also Rotemberg and Woodford (1993); Basu and Fernald (2002); Fernald and Neiman (2011) for a similar strategy.

ied by the nominal investment rate. The second right hand side term is a combination of a discount factor (β) and the depreciation rate (δ). For the sake of simplicity, as in Karabarbounis and Neiman (2014), these factors are assumed to be common across time and countries.[58] All the data needed to compute μ is obtained from national accounts. Given that Karabarbounis and Neiman (2014) reasoning is based on the transition between steady states, this part of the analysis focuses on the long-run impact of μ on our variables of interest (q, ky, and lis) by estimating an ECM using different Pesaran-type estimators. Given data availability, the sample period covers 1980-2014 when q and ky are the dependent variables, and 1980-2009 for the lis.

Table 7: Markups: International Comparison

	[1] 2FE	[2] MG	[3] CMG	[4] CMGt	[5] 2FE	[6] MG	[7] CMG	[8] CMGt	[9] 2FE	[10] MG	[11] CMG	[12] CMGt
	Dependent variable: Δq				Dependent variable: Δky				Dependent variable: Δlis			
X_{t-1}	-0.293	-0.55	-0.558	-0.627	-0.031	-0.162	-0.086	-0.254	-0.206	-0.414	-0.351	-0.444
	(0.059)***	(0.049)***	(0.069)***	(0.070)***	(0.014)**	(0.034)***	(0.037)**	(0.040)***	(0.046)***	(0.044)***	(0.054)***	(0.067)***
$markup_{t-1}$	0.117	0.526	0.426	0.505	-0.066	-0.084	-0.112	-0.051	-0.133	-0.227	-0.229	-0.268
	(0.052)**	(0.135)***	(0.203)**	(0.238)**	(0.033)*	(0.040)**	(0.027)***	(0.030)*	(0.050)**	(0.045)***	(0.034)***	(0.056)***
$\Delta markup_t$	0.021	-0.094	0.005	0.088	0.158	0.363	0.175	0.15	-0.168	-0.015	-0.133	-0.139
	(0.106)	(0.222)	(0.229)	(0.272)	(0.045)***	(0.042)***	(0.028)***	(0.031)***	(0.070)**	(0.061)	(0.069)*	(0.071)*
t		-0.001		0.0001		0.0001		-0.001		-0.001		-0.001
		(0.002)		(0.002)		(0.000)		(0.001)		(0.000)		(0.001)
Constant	-0.147	-0.431	-0.215	-0.118	0.106	0.265	0.047	0.119	0.003	-0.037	0.004	-0.149
	(0.047)***	(0.167)***	(0.277)	(0.431)	(0.030)***	(0.043)***	(0.034)	(0.044)***	(0.028)	(0.053)	(0.033)	(0.086)*
Number of id	31	31	31	31	25	25	25	25	17	17	17	17
Observations	710	710	710	710	572	572	572	572	404	404	404	404
R-squared	0.43				0.61				0.4			
RMSE	0.1029	0.0982	0.0706	0.0652	0.0137	0.013	0.0082	0.0074	0.02	0.0173	0.0137	0.013
lr-$markup$	0.4009	0.9562	0.7644	0.8051	-2.099	-0.5162	-1.2963	-0.2011	-0.6487	-0.5494	-0.6526	-0.6039
se-$markup$	0.1838	0.2591	0.3751	0.3905	1.6899	0.268	0.6427	0.1216	0.1444	0.1231	0.1399	0.1562
Trend		0.29		0.1		0.32		0.36		0.12		0.29
CD test	-2.3471	28.0625	-0.4653	-0.9004	-2.5823	14.3125	-2.1381	-0.7576	-3.0758	3.6063	-1.5579	-1.6566
Abs Corr	0.2702	0.3476	0.238	0.2365	0.2708	0.2774	0.217	0.2357	0.2116	0.1994	0.2286	0.236
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
2FE = 2-way Fixed Effects, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends.
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%. lr-$markup$ and se-$markup$ represent respectively $markup$'s long-run impact and its standard error. X_{t-1} is the lagged level of the dependent variable.

Table 7 present the results. Columns [1]-[4] show a clear positive and significant impact of our markup proxy on Tobin's Q. As expected, columns [5]-[9] present a negative relationship between market power and the capital-output ratio. Finally, similarly to Barkai (2017) and Autor et al. (2017) for the U.S., we find a negative impact of markups on the labor share. In particular, for our preferred estimator (column [12]), we get that a 1 percentage point increase in the markup decreases the labor share by 0.6%.

[58] β is defined to be $\beta = \frac{1}{1+0.1}$ and $\delta = 0.10$.

6.3 Corporate Governance

The last factor under analysis is corporate governance (GOV). Improvements in corporate governance may increase shareholder control or change incentives towards more shareholder-oriented goals. In our model, these improvements would make γ and $m(\gamma, r)$ closer to one, rising Q and reducing physical investment and the labor share. Empirically, we proxy the level of corporate governance regime by using the Corporate Governance Pillar (CGVSCORE) Index obtained from the Asset4 ESG Database provided by Datastream. This index measures corporate governance practices in terms of to what extent board members and executives act in the best interest of shareholders.[59] This database provides yearly firm-level data for the period 2002-2014.

We split this section in two parts. First, we study the relation between Q, the capital-output ratio and the corporate governance index at the aggregate (country) level. Secondly, we focus on the U.S. and exploit the firm-level dimension of our data using different proxies for investment.

6.3.1 Aggregate Analysis

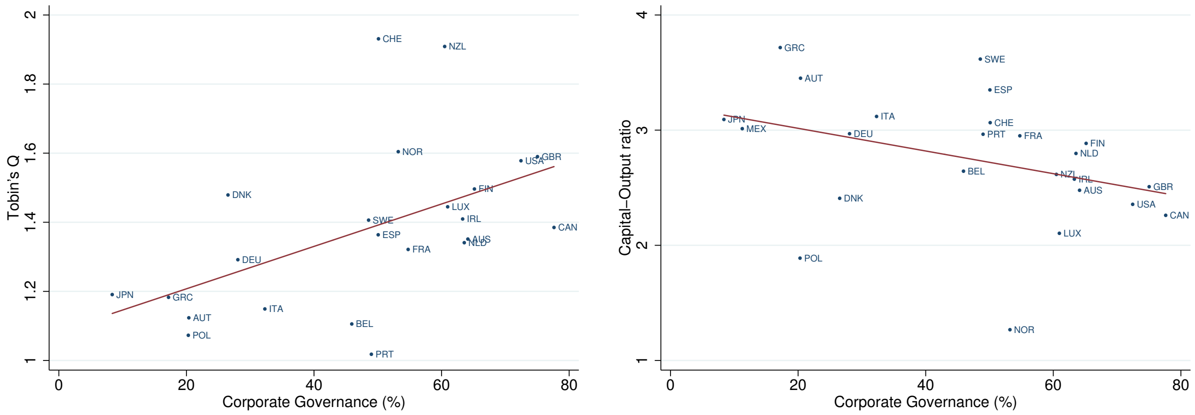
In order to obtain country-level data of Tobin's Q and corporate governance, we follow the same strategy explained in Section 3 for Tobin's Q. That is, firm-level data is first clustered in 17 different industries using the Fama-French classification, where we compute the industry median of our variables of interest.[60] Country data is aggregated as the market value weighted average of the median industries.[61]

[59]To be precise, CGVSCORE defines corporate governance in the following way: "The corporate governance pillar measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value".

[60]We constrain the sample to include only firms for which we have data on both Tobin's Q and the corporate governance index.

[61]As before, in order to be safe about potential outliers we just include sector-year pairs where we have data for at least three companies.

Figure 10: Tobin's Q, Capital-Output ratio and Corporate Governance (I)



(a) Tobin's Q (b) Capital-Output ratio

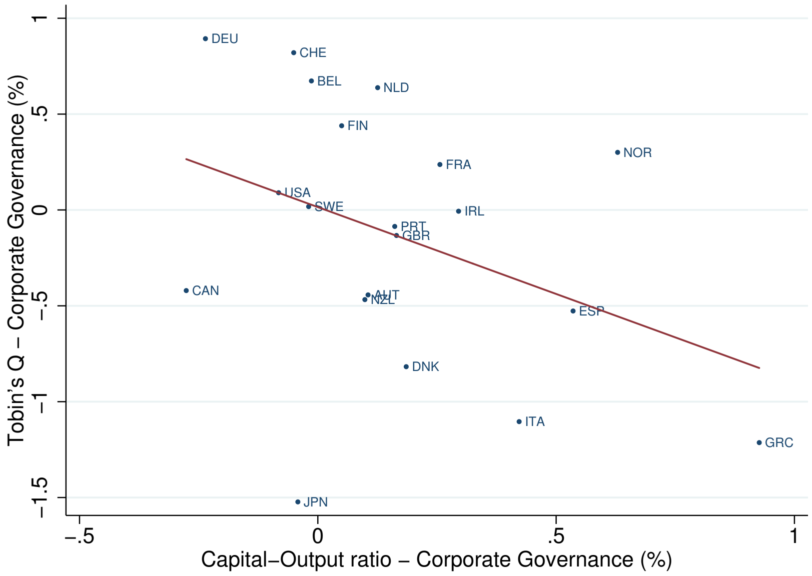
Given the shorter time dimension available, we exploit the cross-section variation across countries to study the relationship between Q, the capital-output ratio and our corporate governance variable. More specifically, Figure 10.a and 10.b present the relation between the corporate governance index, and Tobin's Q and the capital-output ratio, respectively.

The first noticeable result is the existence of country heterogeneity regarding the value of corporate governance. Among the countries with the smallest value we find Japan, Greece, Austria and Poland, all of them with values of the corporate governance index around 20%. On the other extreme, Anglo-Saxon countries (U.S., U.K. and Canada) appear to be the ones that are more "shareholder oriented", with corporate governance index values of around 80%. This is consistent with the evidence and analysis provided by the traditional comparative political economy literature.

Figure 10 presents two important facts: (i) there is positive relationship between corporate governance and Tobin's Q (Figure 10.a), and (ii) there is a negative relationship between corporate governance and the capital-output ratio (Figure 10.b). In other words, Figure 10 is consistent with our model, which rationalizes that economies where companies' goals are more shareholder oriented present a larger Q and a smaller capital-output ratio. Figure 10.a is also consistent with Piketty and Zucman (2014)'s interpretation for high Tobin's Q in Anglo-Saxon countries, which they relate to the higher degree of shareholders' rights protection.

Figure 11 shows the cross-country variation by presenting a scatter plot where the vertical (horizontal) axis displays the coefficients α_1 from the country-specific equation $\ln(X_t) =$

Figure 11: Tobin's Q, Capital-Output ratio and Corporate Governance (II)



Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. GOV is the corporate governance index, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constrained to have the same number of observations. Each regression only includes countries which have at least 10 observations for the period 2002-2014. The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA. Correlation coefficient= -0.38^*.

$\alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents, depending on the specification, Q or KY, and GOV is the corporate governance index. We observe a negative relationship between the impact of corporate governance on Tobin's Q and its impact on the capital-output ratio.[62]

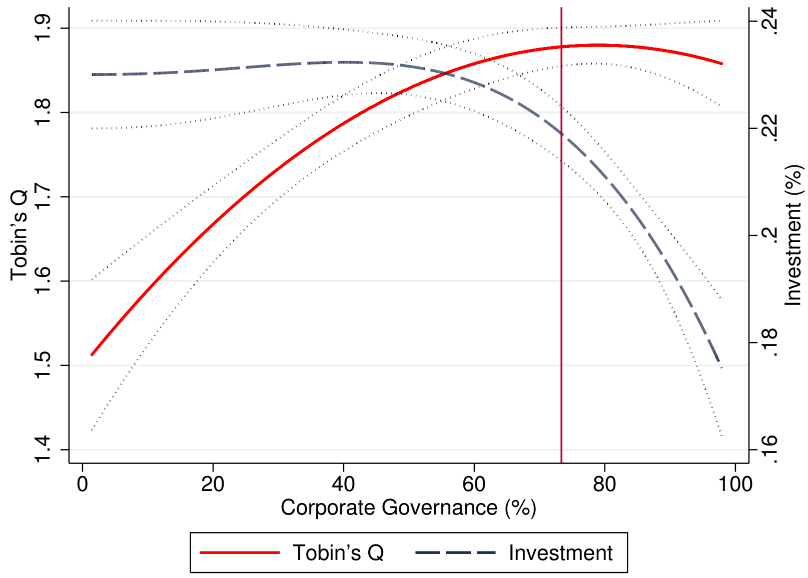
6.3.2 Firm-level Analysis

This section uses U.S. firm-level data on investment. Our investment variable is firm's capital expenditure over the firm net property, plant and equipment, obtained from Worldscope, as in Gompers et al. (2003) and Gutiérrez and Philippon (2016). Tobin's Q and corporate governance data come again from Worldscope and Asset4 ESG database, respectively. We restrict our sample to include only firm-year pairs with available data on our three variables of interest. Like in Gutiérrez and Philippon (2016), we capped Q at 10. Finally, we have 14,434 yearly observations on 1772 U.S. publicly listed companies.

[62]It is worthy to note that this data has some peculiar characteristics. Contrary to our hypothesis and the cross-country analysis, Figure B5 in Appendix B shows that most of the countries has a negative within-country correlation between the Q and the corporate governance index, and a positive relation between the latter and the capital-output ratio. Figure B6 limits the analysis to the period 2002-2007 and proves that this odd result is due to the inclusion of the Great Recession period in a relatively small sample. Figure B7 replicates Figure 11 when just the period 2002-2007 is considered, showing that the negative relationship between the coefficients is still present.

Figure 12 shows a descriptive picture of our data by displaying the fractional polynomial regression line between our variables of interest (Tobin's Q and investment (INV)) and the corporate governance index, along with the 95% confidence intervals. The vertical line represents the median value of the corporate governance index (73.36). As expected, Tobin's Q increases with corporate governance. The pattern followed by investment is less expected. We observe that larger values of corporate governance are indeed related to lower investment levels, but this negative relationship holds primarily (and strongly) for values of the corporate governance index above 60%.

Figure 12: Tobin's Q, Investment and Corporate Governance (I)



Notes: Fractional polynomial regression line (along with the 95% confidence intervals). The vertical line represents the median value for corporate governance (73.36). The sample consists of 14,434 observations for 1772 publicly listed U.S. companies during the period 2002-2014.

Despite this evidence, a deeper econometric exercise is convenient. We follow Gompers et al. (2003) and regress Q and investment on the lagged corporate governance proxy. We also include different dummies to control for potential unobservable factors (μ_{it}):

$$\begin{aligned} \ln(Q_{it}) =& \alpha_0 + \alpha_1 GOV_{it-1} + \mu_{it} + \epsilon_{it} \\ INV_{it} =& \beta_0 + \beta_1 GOV_{it-1} + \mu_{it} + \varepsilon_{it}, \end{aligned} \tag{33}$$

Table 8 shows the results. Tobin's Q (Investment) regressions are presented in Panel A (Panel B). Each column includes different fixed effects. Column [1] includes 2-digit SIC fixed effects. Column [2] further controls by year fixed effects. Columns [3]-[4] show the interaction effects of 2 and 3-digit SIC industries, respectively, with year dummies. Col-

Table 8: Tobin's Q, Investment and Corporate Governance

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Dependent variable: q						
GOV_{t-1}	0.170	0.178	0.187	0.160	0.083	0.151	0.112
	(0.044)***	(0.047)***	(0.048)***	(0.051)***	(0.036)**	(0.045)***	(0.040)***
Constant	0.350	0.446	0.340	0.358	0.409	0.377	0.446
	(0.029)***	(0.029)***	(0.032)***	(0.034)***	(0.024)***	(0.031)***	(0.026)***
R-squared	0.25	0.28	0.33	0.48	0.42	0.44	0.5
Panel B	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Dependent variable: INV						
GOV_{t-1}	-0.042	-0.044	-0.046	-0.039	-0.044	-0.043	-0.050
	(0.019)**	(0.019)**	(0.019)**	(0.018)**	(0.018)**	(0.017)**	(0.019)***
Constant	0.242	0.218	0.245	0.241	0.244	0.245	0.261
	(0.013)***	(0.014)***	(0.013)***	(0.012)***	(0.012)***	(0.011)***	(0.012)***
R-squared	0.09	0.1	0.14	0.25	0.18	0.19	0.22
Observations	12574	12574	12574	12574	12574	12574	12574
Firms	1695	1695	1695	1695	1695	1695	1695
SIC4	365	365	365	365	365	365	365
SIC3	212	212	212	212	212	212	212
SIC2	62	62	62	62	62	62	62
SIC2 FE	YES	YES	NO	NO	NO	NO	NO
SIC3 FE	NO	NO	NO	NO	NO	YES	NO
SIC4 FE	NO	NO	NO	NO	YES	NO	YES
Time FE	NO	YES	NO	NO	NO	NO	NO
SIC2*Time	NO	NO	YES	NO	NO	YES	YES
SIC3*Time	NO	NO	NO	YES	NO	NO	NO

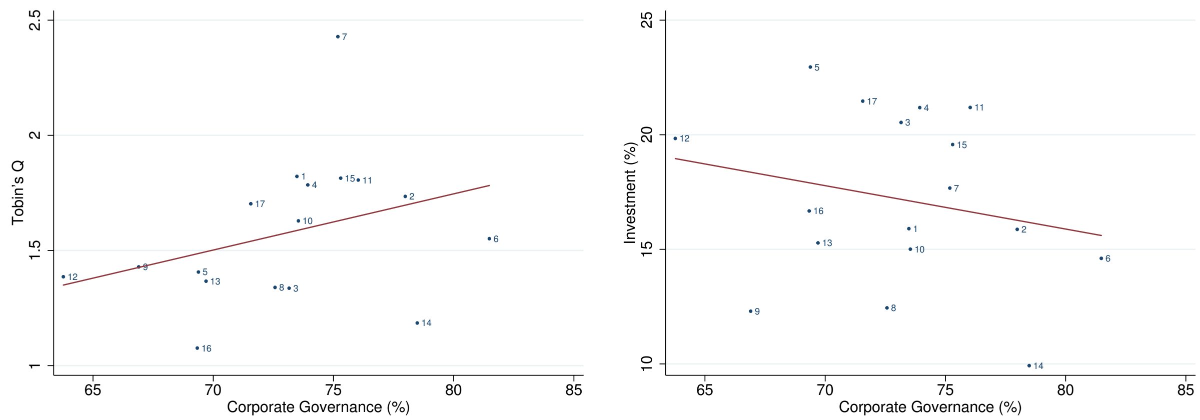
Notes: Robust standard errors clustered at 2-digit SIC level in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. SIC4, SIC3 and SIC2 indicate the number of groups included in the regressions classified at the 4, 3 and 2-digit SIC level.

umn [5] include 4-digit SIC fixed effects, and columns [6]-[7] control for the interaction between 2-digit SIC industries and year dummies along with 3 and 4-digit SIC industries fixed effects.

Our results are robust across specifications and show a positive relation between governance and Tobin's Q, and a negative relation between investment and governance. More specifically, an increase in the governance index of 1 percentage point is associated with an increase in Tobin's Q between 0.08% and 0.19%. Regarding investment, we find that a rise of 1 percentage point in the governance index is related to an investment decrease of around 0.05 percentage points.

To conclude, we further exploit our data by analyzing the cross-industry variation for the U.S. More specifically, Figure 13 shows the relation between our variables of interest and the governance index for the 17 Fama-French industry classification. Once again we see that industries where its board members and executives are more aligned with the interest of its shareholders present a higher Q and lower investment.[63]

Figure 13: Tobin's Q, Investment and Corporate Governance (II)



(a) Tobin's Q (b) Investment

All in all, we find supporting evidence for the three determinants of Q proposed in this paper. However, it is important to keep in mind that this section is not claiming any causal relation, and that further analysis would be needed in order to assess the relevance of the different channels that affect Tobin's Q and asset prices. The key result of the paper

[63]Under the use of the firm-level investment proxy, we do not find that firms where the Q is more sensitive to changes in corporate governance are also the ones where the investment declines the most in response to changes in GOV. This could be due to the difficulties to control for other firm relevant factors.

(i.e. the long-run negative impact of asset prices on the labor share through a slowdown of investment), however, might be valid for other driving forces behind Q.

7 Conclusions

The secular decline of the global labor share has received vivid attention in the last years. We contribute to this recent literature by proposing a new mechanism that links the evolution of the labor share with the evolution of financial wealth, physical capital stock, and equity Tobins Q.

In our model, an increase in equity Tobins Q boosts financial wealth pushing investors to demand a higher return on equity. Firms respond by reducing investment and, consequently, the capital-output ratio. This raises equity returns but drives the labor share down when capital and labor are complements. Therefore, our paper propose a theory that reconciles the decline of the labor share with values of the elasticity of substitution below 1.

We test our model estimating different mean group estimators based on a common factor model. Our results suggest that the global increase of Tobin's Q since 1980 is associated to the decline of the labor share and explains between 41% and 57%, depending on the estimator, of such decline. When the relative price of investment is included in our estimations, we find that it does not have any significant effect on the labor income share.

Our results show that the endogenous negative relationship between asset prices and corporate capital, embodied in the equity Tobin's Q ratio, is crucial to understand the dynamics of the capital-output ratio and the labor share. We also find evidence suggesting that the global rise of asset prices might be related to widespread changes in dividend taxation, expected market power rents and changes in corporate governance.

In light of our findings, we believe that the decline of the labor income share might not be primarily the irreversible consequence of technological drivers, like those associated to capital-deepening factors, but the result of policies and institutional designs that boost asset prices at the expense of investment.

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APPENDIX A. Tobin's Q derivation

Proposition 2. *In symmetric equilibrium, steady state Tobin's Q is*

$$Q(r) = (1-\tau)\left(\frac{1-\gamma+r}{\gamma r} + \frac{F(k(r),l)}{\xi r k(r)}\right) \tag{A1}$$

Proof. For Tobin's Q derivation, we follow Brun and Gonzalez (2017) closely. Firm i solves

$$V(k_i) = \max_{k_i', l_i} \left\{ \frac{\text{div}_i(1-\tau)}{p} + \gamma \frac{V(k_i')}{1+r'} \right\} \tag{A2}$$

subject to $p_i F(k_i, l_i) = w_i l_i + \text{div}_i + p(k_i' - (1-\delta)k_i)$ and $\frac{y_i}{y} = \left(\frac{p_i}{p}\right)^{-\xi}$. The first order condition with respect to k_i' is:

$$p' k_i' \frac{(1+r')}{\gamma} = \left(\frac{\xi-1}{\xi}\right) p_i' F_k(k_i', l_i') k_i' + p'(1-\delta) k_i' \tag{A3}$$

Since we have constant returns to scale, the production function satisfies

$$F(k,l) = F_k(k,l)k + F_l(k,l)l$$

Plugging in the first order condition with respect to labor, $w_i = \left(\frac{\xi-1}{\xi}\right) p_i F_l(k_i, l_i)$, we get:

$$F_k(k_i,l_i)k_i = F(k_i,l_i) - F_l(k_i,l_i)l_i = F(k_i,l_i) - \left(\frac{\xi}{\xi-1}\right)\frac{w}{p_i} l_i$$

Multiplying both sides by $\left(\frac{\xi-1}{\xi}\right) p_i$, we get:

$$\left(\frac{\xi-1}{\xi}\right) p_i F_k(k_i,l_i)k_i = p_i F(k_i,l_i) - w l_i - \frac{1}{\xi} p_i F(k_i,l_i),$$

Using the flow and funds constraint of the firm, we get:

$$\left(\frac{\xi-1}{\xi}\right) p_i' F_k(k_i',l_i')k_i' = \text{div}_i' + p'(k_i'' - (1-\delta)k_i') - \frac{1}{\xi} p_i' F(k_i',l_i'),$$

Using this expression, we can rewrite A3 as:

$$p' k_i' \frac{(1+r')}{\gamma} = \text{div}_i' + p' k_i'' - \frac{1}{\xi} p_i' F(k_i', l_i')$$

or just:

$$k_i' = \gamma\left(\frac{\text{div}_i'}{p'\,(1+r')} - \frac{1}{\xi}\frac{p_i' F(k_i', l_i'}{p'\,(1+r')} + \frac{k_i''}{(1+r')})\right) \tag{A4}$$

Using forward substitution and the transversality condition, we get:

$$k_{it+1} = \sum_{j=1}^{\infty}\left(\frac{\gamma^j}{\prod_{l=1}^{j}(1+r_{t+l})}\frac{\text{div}_{it+j}}{p_{t+j}} - \frac{\gamma^j}{\xi}\frac{p_{it+j}}{p_{t+j}}\frac{F(k_{it+j}, l_{it+j})}{\prod_{l=1}^{j}(1+r_{t+l})}\right) \tag{A5}$$

Note that equity returns are given by:

$$1 + r_i' = \frac{\text{div}_i'(1-\tau) + v_i'}{v_i}\frac{p}{p'} \tag{A6}$$

Using forward substitution and the transversality condition, we get the standard equity price expression:

$$\frac{v_{it}}{p_t} = (1-\tau)\sum_{j=1}^{\infty}\frac{1}{\prod_{l=1}^{j}(1+r_{t+l})}\frac{\text{div}_{it+j}}{p_{t+j}} \tag{A7}$$

Tobin's Q is the ratio $\frac{v_{it}}{p_t k_{it+1}}$. Using A5 and A7:

$$Q_t = (1-\tau)\left(1 + \frac{1}{\xi}\frac{1}{k_{it+1}}\sum_{j=1}^{\infty}\frac{p_{it+j}F(k_{it+j}, l_{it+j})\gamma^j}{p_{t+j}\prod_{l=1}^{j}(1+r_{t+l})} + \frac{1}{k_{it+1}}\sum_{j=1}^{\infty}\frac{\text{div}_{it+j}\,(1-\gamma^j)}{p_{t+j}\prod_{l=1}^{j}(1+r_{t+l})}\right) \tag{A8}$$

In symmetric equilibrium, all firms produce the same output, own the same capital, have the same equity value and, therefore, have the same Tobin's Q. At the steady state, this equation becomes:

$$Q(r) = (1-\tau)\left(\frac{1-\gamma+r}{\gamma r} + \frac{F(k(r), l)}{\xi r k(r)}\right) \tag{A9}$$

□

APPENDIX B: Supplementary tables and figures

Table B1: Selected Economies and Sample Period

#	Country	Sample period	#	Country	Sample period
1	Australia**	1980-2008	22	Luxembourg*	1991-2008
2	Austria**	1980-2008	23	Mexico**	1988-2008
3	Belgium**	1980-2008	24	Morocco	1998-2007
4	Brazil*	1992-2008	25	Netherlands**	1980-2008
5	Canada**	1980-2008	26	New Zealand**	1986-2008
6	Chile*	1990-2008	27	Norway**	1980-2007
7	China	1995-2007	28	Peru	1992-2003
8	Colombia	1993-2007	29	Philippines**	1988-2008
9	Denmark**	1980-2009	30	Poland	1995-2008
10	Finland**	1987-2009	31	Portugal**	1988-2009
11	France**	1980-2009	32	South Africa**	1980-2008
12	Germany**	1983-2008	33	Spain**	1986-2008
13	Greece**	1988-2009	34	Sri Lanka	1994-2008
14	Hong Kong**	1980-2003	35	Sweden**	1982-2009
15	Hungary	1995-2008	36	Switzerland**	1980-2007
16	India*	1991-2008	37	Thailand	1988-2003
17	Ireland**	1981-2008	38	Turkey	1990-2003
18	Israel	1993, 1995-2008	39	UK**	1980-2008
19	Italy**	1980-2008	40	US**	1980-2008
20	Japan**	1980-2007	41	Venezuela	1992-2006
21	Korea**	1980-2003			

Notes: Countries with at least one asterisk indicate they are used in the regressions presented in columns [1]-[5] of Table 4. Countries with two asterisks indicate they are used in the regression presented in column [7] of Table 4.

Table B2: Fama-French 17 Industries Classification

#	Sector	#	Sector
1	Food	9	Steel
2	Mining	10	Fabricated Products
3	Oil	11	Machinery
4	Textiles & Apparel	12	Automobiles
5	Consumer Durables	13	Transportation
6	Chemicals	14	Utilities
7	Consumables	15	Retail
8	Construction	16	Financials
		17	Other

Table B3: Descriptive Statistics

Panel A: Raw variables					
Variable	Obs	Mean	Std. Dev.	Min	Max
LIS	915	0.468	0.096	0.214	0.636
Q	915	1.241	0.268	0.519	3.229
RP	915	1.041	0.097	0.767	1.413
Panel B: Regression variables (in logs)					
Variable	Obs	Mean	Std. Dev.	Min	Max
lis	915	-0.785	0.234	-1.543	-0.452
q	915	0.195	0.200	-0.655	1.172
rp	915	0.036	0.092	-0.265	0.346

Table B4: Static Baseline Model: Robustness

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt
q	0.003	-0.035	-0.06	-0.056	-0.07	-0.067	-0.081
	(0.012)	(0.014)**	(0.013)***	(0.014)***	(0.034)**	(0.027)**	(0.028)***
t					-0.001		0.0004
					(0.001)		(0.001)
Constant	-0.563	-0.672			-0.625	0.009	-0.023
	(0.027)***	(0.027)***			(0.050)***	(0.110)	(0.126)
Number Id	9	9	9	9	9	9	9
Observations	208	208	208	208	208	208	208
R-squared	0.26	0.87	0.99	0.99			
RMSE	0.0545	0.023	0.0177	0.0182	0.0182	0.0147	0.0126
Trend					0.44		0.56
CD test	-2.3006	-3.8079	-2.3008	-3.425	5.6844	-2.3963	-2.9375
Abs Corr	0.3168	0.3821	0.3235	0.335	0.3411	0.2692	0.2924
Int	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)/I(1)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends.
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%.

Table B5: Dynamic Baseline Model: Robustness

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt	[8] CMGt1	[9] CMGt2
q	0.001	-0.004	-0.025	-0.027	-0.032	-0.015	-0.051	-0.062	-0.062
	(0.004)	(0.008)	(0.009)***	(0.010)***	(0.020)*	(0.013)	(0.024)**	(0.026)**	(0.033)*
lis_{t-1}	0.98	0.868	0.73	0.711	0.638	0.625	0.566	0.508	0.391
	(0.019)***	(0.047)***	(0.054)***	(0.059)***	(0.075)***	(0.088)***	(0.092)***	(0.121)***	(0.145)***
t					-0.0003		-0.0003	0.0003	0.0005
					(0.001)		(0.001)	(0.001)	(0.001)
Constant	-0.014	-0.094			-0.216	0.05	0.059	0.094	0.082
	(0.012)	(0.033)***			(0.053)***	(0.088)	(0.071)	(0.126)	(0.186)
Number of id	9	9	9	9	9	9	9	9	9
Observations	203	203	203	203	203	203	203	199	195
R-squared	0.96	0.96	0.99	0.99					
RMSE	0.0127	0.0124	0.0108	0.0113	0.013	0.0088	0.0085	0.0078	0.0071
Trend					0.11		0	0.11	0.11
lr-q	0.044	-0.027	-0.0935	-0.095	-0.0896	-0.0397	-0.1175	-0.126	-0.1016
se-q	0.1776	0.0585	0.0332	0.0349	0.057	0.0359	0.06	0.0612	0.0588
CD test	-3.6909	-3.7403	-2.8713	-3.4496	6.5542	-2.9223	-2.922	-2.0366	-1.0797
Abs Corr	0.2249	0.2224	0.2544	0.2726	0.3468	0.2557	0.2235	0.1927	0.186
Int	I(0)	I(0)/I(1)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends, CMGt1 and CMGt2 = CMGt with, respectively, one and two extra cross-sectional averages lags, as indicated by Chudik and Pesaran (2015).
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%. lr-q and se-q represent respectively q's long-run impact and its standard error.

Table B6: Static Model with Relative Prices: Robustness

	[1] POLS	[2] 2FE	[3] CCEP	[4] CCEPt	[5] MG	[6] CMG	[7] CMGt
q	-0.012	-0.035	-0.065	-0.063	-0.061	-0.039	-0.099
	(0.013)	(0.014)**	(0.014)***	(0.014)***	(0.028)**	(0.03)	(0.030)***
rp	0.321	-0.02	0.072	0.096	-0.079	0.096	0.073
	(0.077)***	(0.051)	(0.069)	(0.073)	(0.135)	(0.177)	(0.149)
t					-0.002		0.001
					(0.002)		(0.003)
Constant	-0.651	-0.672			-0.612	0.001	-0.139
	(0.031)***	(0.027)***			(0.063)***	(0.205)	(0.184)
Number of id	9	9	9	9	9	9	9
Observations	208	208	208	208	208	208	208
R-squared	0.31	0.87	0.99	0.99			
RMSE	0.0528	0.023	0.0168	0.0176	0.0173	0.0123	0.0096
Trend					0.44		0.56
CD test	-2.8146	-3.7943	-2.3723	-3.3179	5.2023	-2.2852	-2.2934
Abs Corr	0.3707	0.3856	0.3366	0.3499	0.3145	0.2531	0.25
Int	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(0)

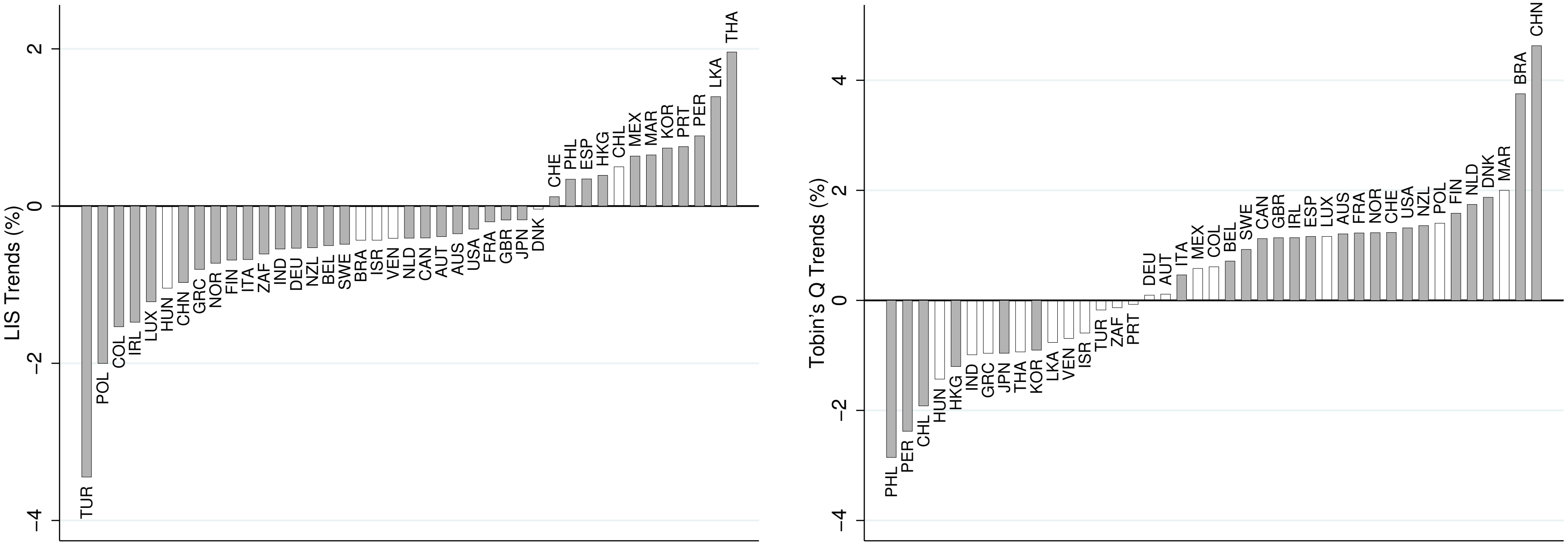
Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
POLS = Pooled OLS (with year dummies), 2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), CCEPt = CCEP with year dummies, MG = Pesaran and Smith (1995) Mean Group (with country-specific linear trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends.
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%.

Table B7: ECM with Relative Prices: Robustness

	[1] 2FE	[2] CCEP	[3] MG	[4] CMG	[5] CMGt	[6] CMGt1	[7] CMGt2
lis_{t-1}	-0.136	-0.192	-0.461	-0.442	-0.579	-0.714	-0.958
	(0.047)***	(0.068)***	(0.111)***	(0.112)***	(0.155)***	(0.181)***	(0.337)***
q_{t-1}	-0.001	-0.003	-0.039	-0.001	-0.05	-0.066	-0.135
	(0.009)	(0.012)	(0.036)	(0.007)	(0.029)*	(0.038)*	(0.078)*
rp_{t-1}	0.043	0.075	0.151	0.108	-0.019	-0.044	0.296
	(0.032)	(0.055)	(0.108)	(0.093)	(0.054)	(0.124)	(0.461)
Δq	-0.039	-0.052	-0.061	-0.043	-0.042	-0.049	-0.091
	(0.018)**	(0.022)**	(0.039)	(0.018)**	(0.010)***	(0.020)**	(0.036)**
Δrp	0.088	0.078	-0.062	0.038	0.02	0.158	0.094
	(0.076)	(0.080)	(0.104)	(0.077)	(0.075)	(0.054)***	(0.297)
t			0.001		0.002	0.001	-0.002
			(0.001)		(0.003)	(0.004)	(0.004)
Constant	-0.066		-0.349	0.048	0.143	0.273	0.181
	(0.034)*		(0.082)***	(0.129)	(0.130)	(0.179)	(0.253)
Number of id	9	9	9	7	7	7	6
Observations	199	199	199	175	175	171	149
R-squared	0.51	0.75					
RMSE	0.0124	0.0098	0.0106	0.0067	0.0061	0.0051	0.0039
Trend			0.22		0.43	0.14	0
lr-q	-0.0052	-0.0164	-0.0847	-0.0011	-0.0863	-0.0919	-0.1404
se-q	0.065	0.0599	0.0799	0.0149	0.0556	0.0576	0.0949
lr-rp	0.3149	0.3911	0.3266	0.2434	-0.0324	-0.062	0.3092
se-rp	0.2716	0.3177	0.247	0.2199	0.0938	0.1747	0.4931
CD test	-3.8732	-2.7485	3.7987	-2.0474	-2.347	-2.4567	-1.9305
Abs Corr	0.2378	0.2169	0.3325	0.2104	0.2141	0.2757	0.2229
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Notes: Robust standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.
2FE = 2-way Fixed Effects, CCEP = Pooled Pesaran (2006) Common Correlated Effects (CCE), MG = Pesaran and Smith (1995) Mean Group (with country trends), CMG = Pesaran (2006) CCE Mean Group, CMGt = CMG with country-specific linear trends, CMGt1 and CMGt2 = CMGt with, respectively, one and two extra cross-sectional averages lags, as indicated by Chudik and Pesaran (2015).
CD-test reports the Pesaran (2004) test statistics, under the null of cross-section independence of the residuals. Int indicates the order of integration of the residuals (I(0) - stationary, I(1) - nonstationary) obtained from Pesaran (2007) CIPS test. RMSE presents the root mean squared error. Trend show the share of countries where the linear trend is significant at 5%. lr-q and se-q represent respectively q's long-run impact and its standard error. lr-rp and se-rp represent respectively rp's long-run impact and its standard error.

Figure B1: Trends in Country Labor Income Shares and Tobins' Q



(a) Labor Income Shares

(b) Tobins' Q

Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 t + \epsilon_t$, where X represents the labor share and our Tobin's Q, t is a linear trend, and *epsilon* is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level. The coverage is presented in Table B1 (915 observations, 41 countries).

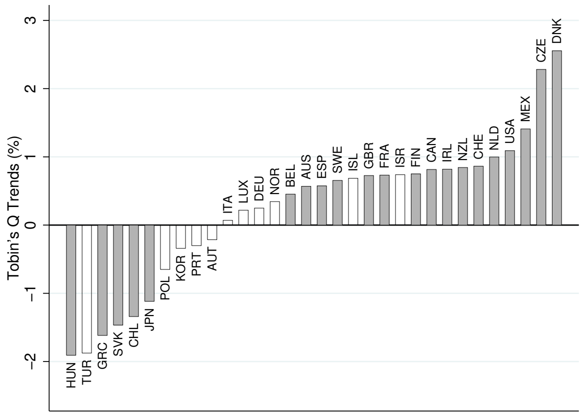
Figure B2: Tobin's Q against Relative Prices

Notes: Own calculation based on a (outlier-robust) sample of 41 countries and 913 observations. Variables are demeaned to control for fixed effects. Correlation coefficient= -0.11^{***}.

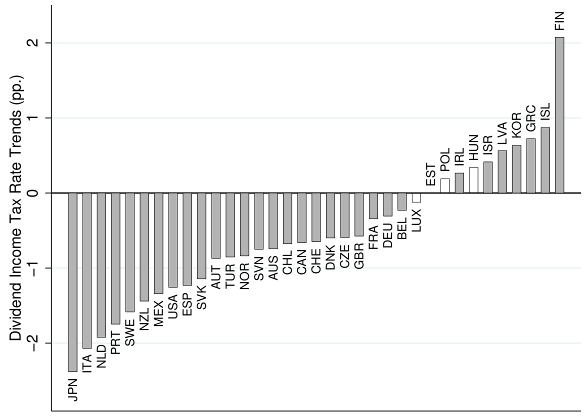
Figure B3: Labor Income Share against Relative Prices

Notes: Own calculation based on a (outlier-robust) sample of 41 countries and 911 observations. Variables are demeaned to control for fixed effects. Correlation coefficient= 0.10^{***}.

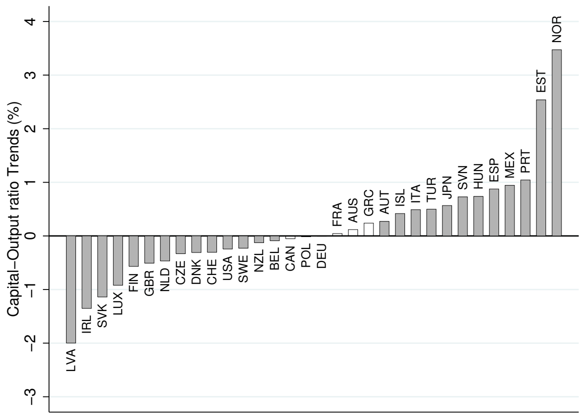
Figure B4: Country-specific Trends: Unrestricted Sample



(a) Tobin's Q



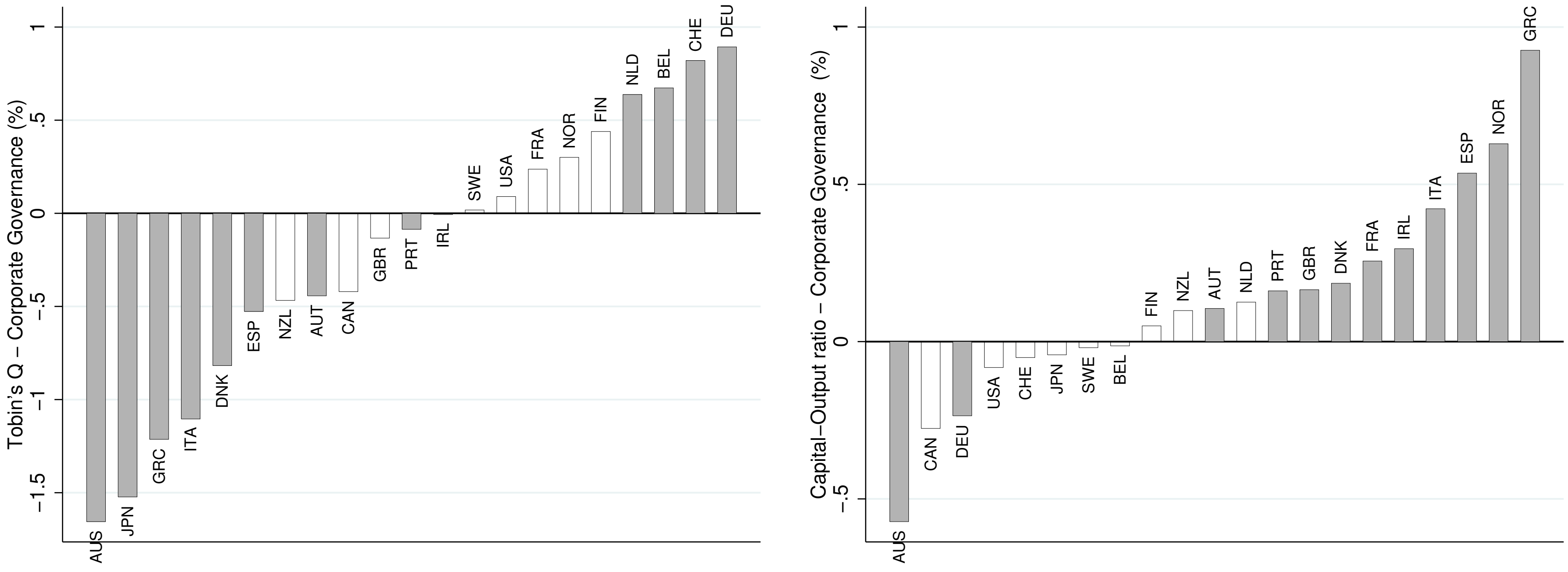
(b) Dividend Income Tax Rate



(c) Capital-Output ratio

Notes: Own calculations obtained from $X_t = \alpha_0 + \alpha_1 t + \epsilon_t$, where X represents our variables of interest (Q and the capital-output ratio in logs), t is a linear trend, and *epsilon* is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level. Each regression only includes countries which have at least 10 observations for the period 1980-2014.

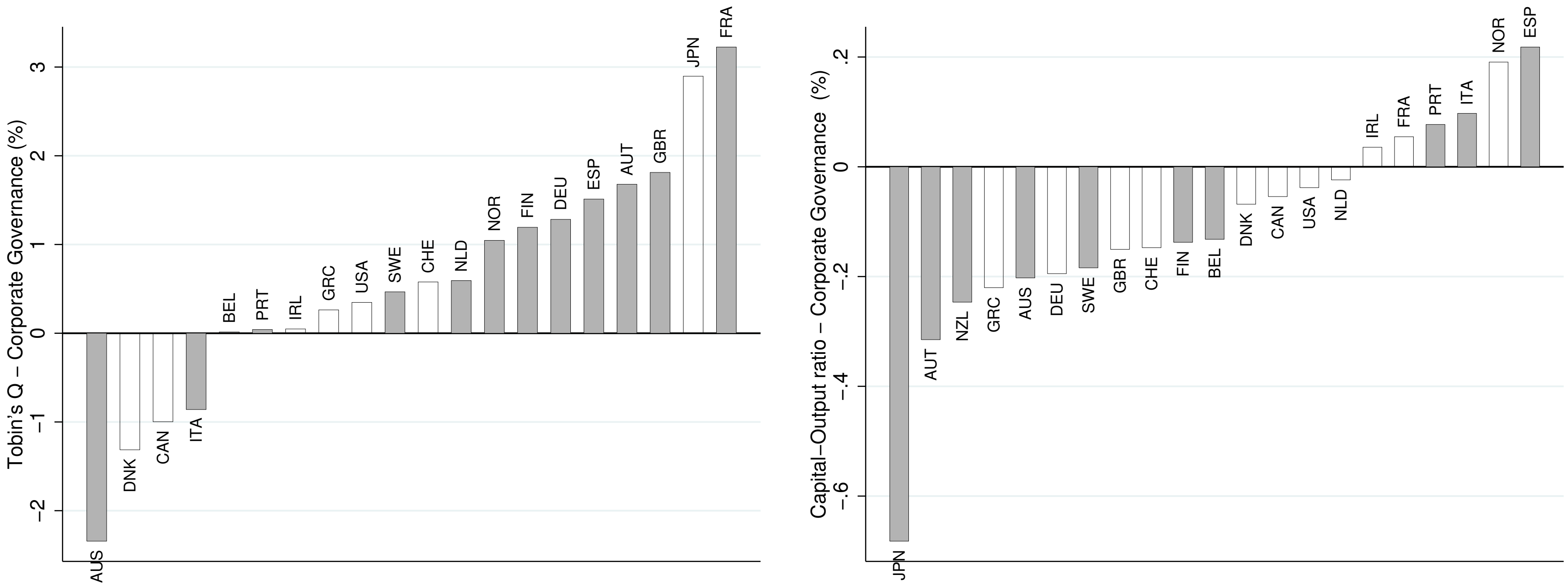
Figure B5: Tobins' Q, Capital-Output ratio and Corporate Governance (All sample)



(a) Tobins' Q (b) Capital-output ratios

Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents Tobin's Q or the capital-output ratio, GOV is corporate governance, and *epsilon* is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level.

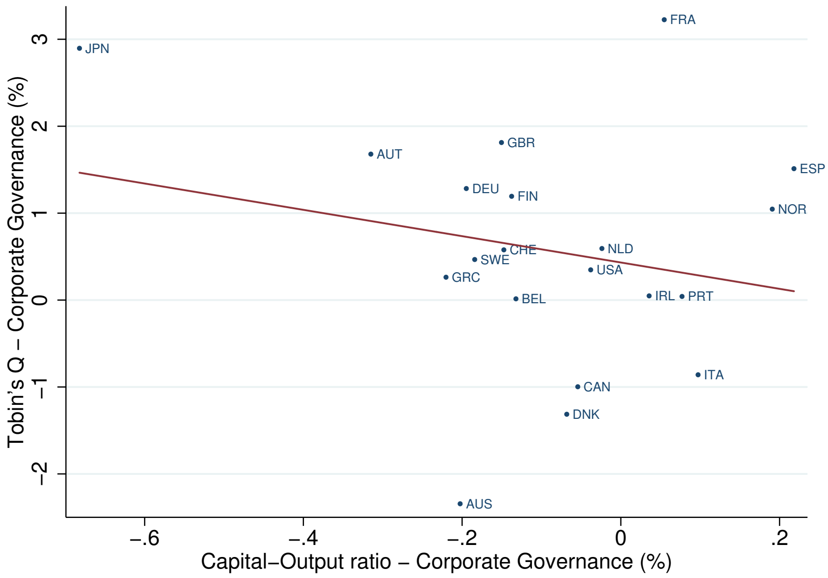
Figure B6: Tobins' Q, Capital-Output ratio and Corporate Governance (2002-2007)



(a) Tobins' Q (b) Capital-output ratios

Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents Tobin's Q or the capital-output ratio, GOV is corporate governance, and *epsilon* is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level.

Figure B7: Tobin's Q, Capital-Output ratios and Corporate Governance (2002-2007) II



Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. GOV is the corporate governance index, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constrained to have the same number of observations. Each regression includes countries which have at least 2 observations for the period 2002-2007. The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA. Correlation coefficient= -0.22.

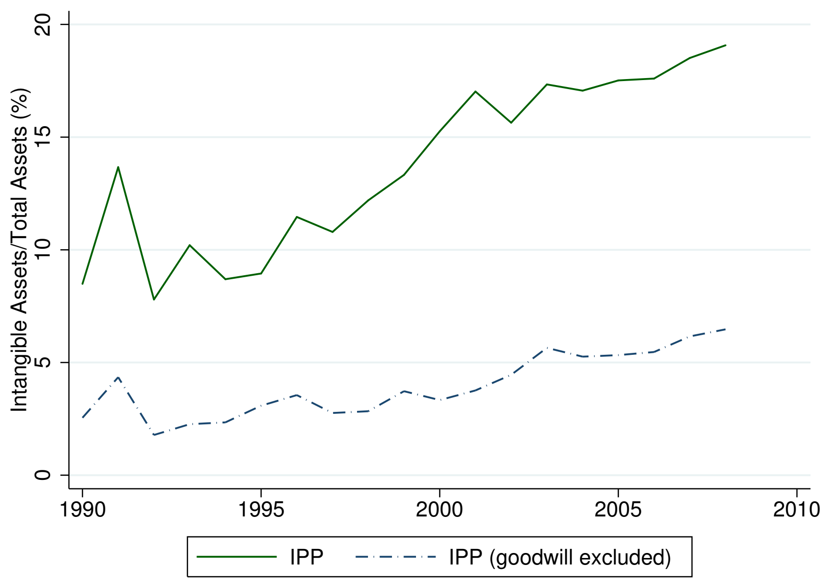
APPENDIX C: Intangible Assets

The rise of intangible assets has become an important topic. Given the rise of intangibles since the mid 90s (Figure C1), many scholars have analyzed their potential implications on different economic aspects (see among others, Koh et al., 2016, Gutiérrez and Philippon, 2016, Peters and Taylor, 2017, Alexander and Eberly, 2018).

Figure C1 shows our own calculation of the U.S. ratio of intangible assets over total assets (ipp). This share is directly obtained from the Worldscope database at the firm level. Country-level data is obtained as the firm market value weighted average.[64] We present both the ratio of intangible over total assets (solid line) and intangibles excluding goodwill to assets (dashed-dot line). The last measure is usually considered more informative about the state of intangible capital as most of the goodwill is account for M&A and not formation of intangible capital.

Although both series are increasing, their trends and magnitudes differ significantly. For the total ipp ratio, the share has almost double between 1990 and 2008 evolving from a value of 10% to 19% with a positive trend starting in the mid-'90s. Regarding the measure that excludes goodwill, both the magnitude and the trend are less pronounced. The share increased from 2.5% in 1990 to 6.5% in 2008 with the main changed in the trend happening at the beginning of the new century.

Figure C1: U.S. Intangible Assets Intensity (1990-2008)



Notes: Market value weighted average from a sample of 9,727 publicly listed U.S. companies.

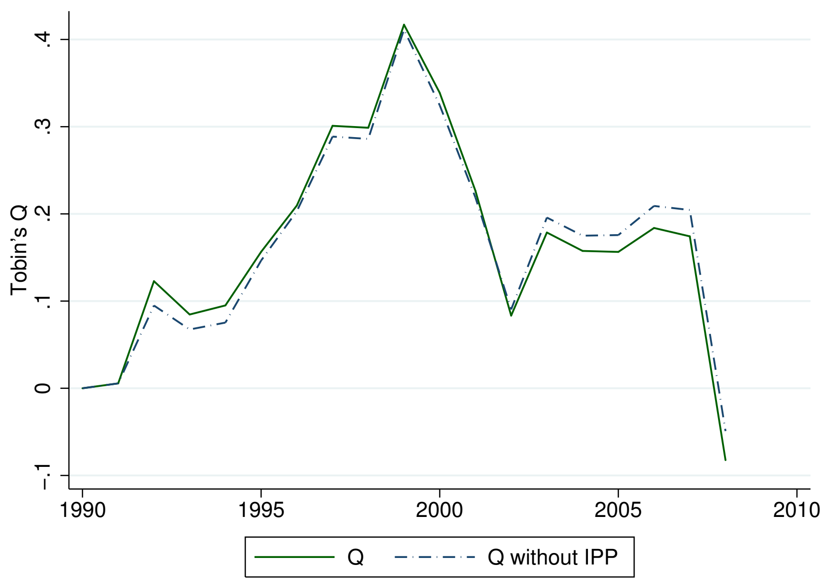
The ipp rise is relevant in our study because it can artificially increase Tobin's Q due to a problem of measurement. In particular, given that intangible assets are more difficult

[64]For sake of comparison total assets are defined in the same way as Tobin's Q denominator (i.e. excluding preferred stocks). Tobin's Q is capped at 10.

to measure than traditional capital, its recent increase can provoke an underestimation of the firm's stock of capital, and therefore, an overestimation of firm's Q.

Given that our main analysis exploits within-country variation, we need to check if the rise of ipp is related with an overestimation of our empirical measure of Q. In order to do so, Figure C2 presents the year dummies coefficients from a market value weighted regression including 4-digit SIC level fixed effects. The difference between the solid and dashed-dot line is that the latter further includes the ipp share (without goodwill) as a regressor. If our measure of Tobin's Q was biased due to the rise of ipp, we would expect a lower Q after 2000 when we are controlling for the share of intangible assets (dashed-dot line). However, along the period under analysis, we do not observe a significant difference between the two series. These results allow us to conclude that intangible assets do not significantly bias our Q (within-variation) channel.

Figure C2: Tobin's Q with and without IPP)



Notes: Own calculations obtained as year fixed effects from a market value weighted regression including country including 4-digit SIC level fixed effects. The difference between the solid and dashed-dot line is that the latter further includes the ipp share (without goodwill) as a regressor (Sample includes 9,727 U.S. publicly listed firms).

APPENDIX D: Technical Appendix

Time-Series Properties

The order of integration and potential cross-section dependence in the data play a central role in panel time-series. In order to deal with potential problems, Tables D1 and D2 analyze, respectively, the order of integration and the cross-section dependence of the variables used in our analysis.

Regarding the order of integration, Table D1 presents the results for two specifications of the cross-sectional augmented panel unit root (CIPS) Pesaran (2007) test. In particular, panel D1.a) shows the results when a constant is included in the Augmented Dickey-Fuller (ADF) regressions, while D1.b) further includes a deterministic trend.

Pesaran (2007) CIPS test belongs to a 2^{nd} generation of panel unit root tests, which are characterized by allowing potential cross-section dependence of the variables. Similar to Im et al. (2003), Pesaran (2007) CIPS test proposes a standardized average of individual ADF coefficients, where the ADF processes have been augmented by the cross-sectional averages to control for the unobservable component.

Table D1 presents the Pesaran (2007) CIPS test values along with their corresponding $p-value$ for our three variable of interest. "Lags" indicates the lag augmentation in the Dickey-Fuller regression. Given that the null of nonstationarity is only rejected in 4 out of 30 cases, we can safely assert that the variables under analysis are nonstationary.

Table D1: Unit Root Tests

a) Pesaran (2007) CIPS test: Constant						
Lags	*lis*	(*p*)	*q*	(*p*)	*rp*	(*p*)
0	0.431	0.667	-2.744	0.003	-0.118	0.453
1	-0.207	0.418	-2.405	0.008	-0.141	0.444
2	-1.199	0.115	0.103	0.541	0.655	0.744
3	1.802	0.964	2.942	0.998	2.254	0.988
4	5.477	1.000	6.091	1.000	7.211	1.000
b) Pesaran (2007) CIPS test: Constant and deterministic trend						
Lags	*lis*	(*p*)	*q*	(*p*)	*rp*	(*p*)
0	1.044	0.852	-2.068	0.019	2.483	0.993
1	0.390	0.652	-1.628	0.052	2.052	0.980
2	-0.033	0.487	1.304	0.904	0.998	0.841
3	5.280	1.000	6.785	1.000	6.006	1.000
4	8.090	1.000	8.949	1.000	9.127	1.000

Notes: Pesaran (2007) CIPS test values are obtained from the standardized Z-tbar statistic. H_0 = nonstationarity. Lags indicates the number of lags included in the ADF regression.

Table D2 shows the Pesaran (2004) CD test for cross-section dependence in panel time-series data. This test uses correlation coefficients between the time-series for each panel member and has proved to be robust to nonstationarity, parameter heterogeneity and structural breaks, even in small samples.[65] Table D2 is divided in four different quadrants representing different variable transformations. Quadrants a) and b) present the CD test for the levels and growth rates of our variables, and show that the null hypothesis of cross-section independence is rejected in all the cases. Quadrants c) and d) complement the analysis by checking the power of the cross-section averages to control for cross-section dependence. In particular, they present the results for the Pesaran (2004) CD test when it is applied to the residuals of an autoregressive regression of order 2 for each variable of interest. While regressions in quadrant c) are estimated by the Pesaran and Smith (1995) Mean Group estimator, panel d) shows the results when the AR process is augmented with cross-section averages in the spirit of Pesaran's (2006) CMG estimator. We can see that, while all the variables reject the null of cross-section independence in panel c), the inclusion of cross-sectional averages in panel d) alleviates the problem for the labor income share and Tobin's Q.

Table D2: Cross-section Dependence Tests

a) Levels:				b) Diff:			
Variable	lis	q	rp	Variable	Δlis	Δq	Δrp
CD-test	16.73	29.76	42.37	CD-test	12.99	34.45	6.66
p-value	0.00	0.00	0.00	p-value	0.00	0.00	0.00
corr	0.132	0.250	0.345	corr	0.11	0.296	0.049
abs(corr)	0.472	0.394	0.558	abs(corr)	0.235	0.349	0.223
c) Het. AR(2)				**d) Het. AR(2) CCE**			
Variable	lis	q	rp	Variable	lis	q	rp
CD-test	9.93	33.58	3.40	CD-test	-0.24	-0.66	-2.38
p-value	0.00	0.00	0.00	p-value	0.81	0.51	0.02
corr	0.088	0.301	0.027	corr	-0.006	-0.011	-0.023
abs(corr)	0.243	0.344	0.213	abs(corr)	0.220	0.237	0.213

Notes: CD-test shows the Pesaran (2004) cross-section dependence statistic, which follows a $N(0,1)$ distribution. H_0 = cross-section independence. corr, and abs(corr) report, respectively, the average and average absolute correlation coefficients across the $N(N-1)$ set of correlations.

[65] The test is computed as:

$$CD = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \sqrt{T_{ij}}\rho_{ij},$$

where ρ_{ij} represents the correlation coefficient between country i and j, while T_{ij} is the number of observations used to computed that correlation.