Firm Ex-ante Heterogeneity, Entry, and the Labour Share*

short title: Heterogeneity, Entry, and Labour Share

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Abstract

This paper considers a two-sector RBC model augmented with firm heterogeneity and firm dynamics and studies the steady state and dynamic properties of the model in response to a decline in the relative price of investment. It shows that both firm heterogeneity and entry play a crucial role in the decline in the labour share and the increase in capital intensity observed in the US economy. Using ORBIS firm-level data of the US economy, the paper finds robust evidence consistent with the mechanisms described in the model.

Keywords: Firm Dynamics, Firm Heterogeneity, Labour Income Share, Capital Intensity, Capital Technological Change, ORBIS Microdata
JEL codes: E21, E22, E25

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1 Introduction

Do firm entry decisions affect the capital to labour ratio (capital intensity) and the labour share? In the presence of a declining relative price of investment, do new firms adopt technologies with higher capital intensity than incumbents? What is the effect of their choices on the labour share?

This paper addresses these questions both theoretically and empirically. The first part of the paper considers a two-sector real business-cycle (RBC) model augmented with firm heterogeneity and endogenous firm dynamics and investigates the properties of the model in response to a decline in the relative price of investment. It shows that a negative shock to the relative price of investment leads new firms to adopt technologies with relatively high capital intensity and low labour share. The second part of the paper exploits ORBIS firm-level data and finds robust evidence consistent with the predictions of the theoretical model. It shows that a lower price of investment in the year of birth of firms implies higher average capital intensity and lower labour share. Furthermore, it shows that differences between firms at birth remain persistent over their lifetime.

This paper offers a new interpretation of the increase in capital intensity and the decline in labour share witnessed in the last decades in the United States (Hergovich and Merz, 2018; Giandrea and Sprague, 2017).[1] The steady increase in capital intensity is traditionally explained by an increase of labour productivity (e.g., Solow, 1956), and recently by capital embodied technological change (Piketty, 2014; Karabarbounis and Neiman, 2014; Acemoglu and Restrepo, 2020; Martinez, 2021, among others). The decline of the labour share has received even more attention, since it contradicts the conventional wisdom regarding constant factor income shares that was first presented by Kaldor (1961). While there is a consensus on the decline of the labour share and its significance (Blanchard and Giavazzi, 2003; Elsby et al., 2013; Piketty, 2014; Karabarbounis and Neiman, 2014; Lawrence, 2015; Autor et al., 2020; Barkai, 2020a; Martinez, 2019, among others), there is less consensus on its causes. The explanations for the change in the labour shares include the decline in the relative price of investment goods (Karabarbounis and Neiman, 2014), an increased automation (Acemoglu and Restrepo, 2020; Martinez, 2021; Bergholt et al., 2021), the emergence of superstar firms (Autor et al., 2020), the reduction in the bargaining power of workers (Blanchard and Giavazzi, 2003; Piketty, 2014) and the increase of firm markups (Barkai, 2020b; De Loecker and Eeckhout, 2018). Kehrig and Vincent (2021) try to disentangle these explanations through an empirical study of the labour share decline using micro-level data about the US manufacturing sector.

[1] Appendix A shows the declining pattern of the labour share and the relative price of investment together with the increasing pattern of capital intensity of the US economy, starting from the mid 1950s.

Closely related to this paper, Karabarbounis and Neiman (2014) explain the increase in capital intensity and the decline in labour share with a decrease in the relative price of investment. They estimate the aggregate capital to labour elasticity of substitution and find it to be greater than one. In such a case, a decline of the relative price of investment implies an increase in capital intensity and a decline in the labour share through a simple substitution mechanism. However, there is a consensus in the literature that capital and labour are complements rather than substitutes (e.g., Chirinko, 2008; León-Ledesma et al., 2010; De La Grandville, 2016; Knoblach et al., 2020). This has questioned the importance of the relative price of investment in explaining the decline of the labour share (e.g., Oberfield and Raval, 2021; Bergholt et al., 2021; Hergovich and Merz, 2018).

This paper shows that a decline of the relative price of investment induces an increase in capital intensity and a decline in the aggregate labour share, when firm heterogeneity and firm dynamics are taken into account. The latter decline occurs also when firms are assumed to have a Cobb-Douglas production function. Thus, this paper contributes to the literature by shedding a new light on the role of the relative price of investment as an explanation for the decline of the labour share and also as an explanation for the increase in capital intensity, using the lenses of firm entry and heterogeneity.

The paper is structured in two parts. The first part describes a simple RBC model characterised by two sectors, a consumption-goods and an investment-goods producing sector. In the consumption-goods sector firms are ex-ante heterogeneous and firm dynamics is endogenous. Firm heterogeneity is specified in terms of the output elasticity of capital in a Cobb-Douglas production function. Moreover, new firms must pay an entry cost upon entrance and firm entry is endogenous. The model is used to investigate the impact of a decline in the relative price of investment. It shows that a decline in the relative price of investment leads to a change in the firms' composition, higher capital intensity and lower labour share. The main mechanism behind the theoretical result is the following. When the relative price of investment declines, households' supply of capital increases, reducing the return of capital and bringing about an increase in capital accumulation, production, and wages. Since firms' production function is Cobb-Douglas, incumbent firms increase both their capital and labour demand. In a "traditional" model, i.e., in a model with homogeneous firms, capital accumulation and output would increase, and the aggregate labour share would remain constant. In a model with firm heterogeneity, lower interest rates give a competitive advantage to firms with relatively higher capital intensive technologies and lower labour income share. Therefore, highly capital intensive - and low labour share - incumbent firms increase their market share leading to a higher capital intensity and lower aggregate labour share. This is the effect of heterogeneity on incumbents, i.e., the effect without the entry-exit mechanism. The heterogeneity effect is augmented by the introduction of firm dynamics and the endogenous entry mechanism. In response to a decline in the relative price of investment, new firms with relatively high capital intensity enter the market, changing the composition of firms in the economy and leading to an additional increase in capital intensity and a decrease in labour share. Thus, the theoretical contribution of this paper is to show that firm ex-ante heterogeneity and dynamics contribute to the explanation of the increase of capital intensity and the decline in the labour share in response to the decline in the relative price of investment. Furthermore, it is shown that the aggregate economy in the model behaves *as if* capital and labour were substitutes. The estimate of the aggregate input elasticity of substitution using the same equation proposed by Karabarbounis and Neiman (2014), but using artificial data produced by the model, yields a capital to labour elasticity of substitution greater than one.

The second part of the paper presents an empirical investigation using firm-level data to confirm the following model predictions. First, the production technology of the average firm entering the economy in a given period depends on the price of investment in that period. In particular, a lower price of investment in the year of birth implies higher average capital intensity and lower labour share. Second, differences at birth are persistent over the lifetime of the firms. These two implications are tested using ORBIS firm-level data in two steps. In the first step firms' capital intensity is regressed on the firms' year of birth and a set of controls. The controls include a dummy age to account for possible life-cycle effects. All the regressions considered imply that, *ceteris paribus*, firms with more recent years of birth have relatively higher capital intensity. In the second step, the relative price of investment *in the year of birth* is added to the regressions. Results show that relative price of investment *in the year of birth* has a negative impact on capital intensity, thus corroborating the mechanism described by the theoretical model. The same regressions are performed using firms' labour share as the dependent variable and a wider set of controls, again confirming the theoretical predictions. Overall, the estimates suggest that firms established in years with a lower relative price of investment display on average higher capital intensity and lower labour share *in the year of observation*. These results are coherent with the theoretical predictions of the model. Furthermore, they suggest that heterogeneity at birth is persistent in time, in line with the findings reported by Sedlek and Sterk (2017) and Sterk et al. (2021). Nonetheless, an empirical counterfactual analysis shows that firms' age also plays a significant role in explaining the increase of capital intensity and the decline of the labour share. This result is coherent with the life cycle movements of labour share in growing incumbents found in Kehrig and Vincent (2021).

The remainder of the paper is organised as follows. Section 2 relates this paper to the recent literature. Section 3 describes the model economy. Section 4 describes the implied steady states and the dynamics when the observed relative price of investment is fed into the model. The resulting labour share and capital intensity are compared to the observed counterparts. Section 5 presents the micro-level evidence supporting the mechanism described by the model. A set of robustness exercises are shown in Appendix D. Finally, Section 6 concludes.

2 Related Literature

The foremost contribution of this paper is to show that the combination of heterogeneous capital intensity and declining price of investment has the potential to generate a declining labour share. The literature has proposed several explanations for the decline of the labour share. Among these, this paper is mostly related to Karabarbounis and Neiman (2014). They show that the relative price of investment can explain half of the observed decline in the labour share in the US and most of the industrialised countries starting from 1980. They consider a model with homogeneous firms and a CES production function where capital and labour are by assumption strong substitute inputs. This assumption is based on estimated values using cross-country data suggesting that the input elasticity of substitution between labour and capital is greater than one. Piketty (2014) also estimates an elasticity of substitution between labour and capital greater than one. However, these estimates are at odds with most of the literature. The majority of the evidence, both macro and micro, estimates values of the elasticity implying that the two inputs are complements rather than substitutes.[2] Because of this, recent theoretical literature has cast doubts on the relevance of the decline of the relative price of investment as a possible explanation for the decrease of the labour share (e.g., Oberfield and Raval, 2021; Bergholt et al., 2021; Hergovich and Merz, 2018, among others). These papers do not consider the role of firm heterogeneity and dynamics.

This paper departs from Karabarbounis and Neiman (2014) by assuming that firms have a Cobb-Douglas production function, which is characterised by a constant labour share. Moreover, firms are heterogeneous and their dynamics is endogenous. In such an economy, a decline in the relative price of investment is followed by a change in firms' composition which ultimately is responsible for the decrease in the labour share, the increase in capital share and profit share. The importance of firm ex-ante heterogeneity and the entry mechanism is empirically validated by using firm-level data. Thus, this paper comes to the same conclusion as Karabarbounis and

[2] De La Grandville (2016) explains the importance of the elasticity of substitution, while Chirinko (2008) writes a survey of the empirical literature. León-Ledesma et al. (2010) provides a list of micro estimates of the elasticity of substitution lower than one. Using 2,419 estimates from 77 studies published between 1961 and 2017 Knoblach et al. (2020) provides a meta-regression analysis for the US economy. They show that capital and labour are mostly complements.

Neiman (2014) - i.e., that the decline in the relative price of investment is important to explain the increase in capital intensity and the decline in the labour share - and can be viewed as a micro-foundation of their results, relying on firm heterogeneity and dynamics as the key mechanisms. For comparison with the analysis made in Karabarbounis and Neiman (2014), the theoretical and empirical investigations are carried out considering the relative price of investment from 1980 in the US Business sector.[3]

Recently, De Loecker et al. (2020b) and Barkai (2020a) claimed that profits share has increased by almost thirty percent, whereas capital income share has decreased in the last three decades, thus challenging theories sustaining capital technological change as a possible explanation of the decline of the labour share. These studies have been questioned by Karabarbounis and Neiman (2019). They provide new support to a decline of the labour share due to an increase in capital income share resulting from capital technological change. Furthermore, Basu (2019) shows that estimates of large and steeply rising markups are implausible, casting new doubts on the relevance of the increase of the markups as the only explanation for the decline of the labour income share. A related explanation for the decline in the labour share has been found in the rise of market concentration and superstar firms (Autor et al., 2020). Blanchard and Giavazzi (2003) were among the first to show that workers' and firms' market power are strongly related to product and labour market deregulation. Particularly, they offer an interpretation of the decline of the labour income share in continental Europe based on deregulation in the labour market, which has determined a new distribution of income and rents between workers and firms.

A further explanation of the increasing capital intensity and declining labour income share has been found in the literature on automation (Acemoglu and Restrepo, 2020, 2018; Martinez, 2021, among others). In particular, Acemoglu and Restrepo (2020) find that robots have a large negative effect on employment and wages. Martinez (2021) investigates the extent to which automation can explain the observed decline in the labour share of income in the US. In his model, the production process of a firm is a set of tasks that can be performed by labour or automated capital, through a Leontief production function. Aggregating over firms, the total output of the economy is given by a CES production function (with an input elasticity of substitution lower than one), whose parameters are determined endogenously by investments and entry-exit decisions of firms with different degrees of automation. He finds evidence that automation is a significant driving force of the recent US labour share decline using industry-level data. The present paper offers a complementary

[3] Appendix D considers a robustness exercise of the empirical investigation by using data from 1970. Further, given the results reported in the recent literature on the decline of the labour income share in the manufacturing sector (e.g., Kehrig and Vincent, 2021), a robustness exercise is performed using the data from Manufacturing.

interpretation of the labour share decline to the one offered in Martinez (2021), based on a different mechanism, a different theoretical framework and empirical strategy. First, it relies on a very simple model where firms are heterogeneous in terms of their output elasticity of capital in a Cobb-Douglas production function. Second, it shows the importance of firm heterogeneity at birth as a determinant of the labour share decline. Finally, it confirms that this type of ex-ante heterogeneity is empirically important and persistent in time, in line with the findings reported by Sterk et al. (2021), obtained by using firm-level data.

A further and alternative explanation of the decline of the labour income share is provided by Elsby et al. (2013) and is based on globalisation and firms' offshoring. The authors stress the importance of the open economy channel and claim that if globalisation continues apace, the labour share will continue to decline, above all in sectors that face the largest increases in foreign competition. The present paper considers a closed economy framework and thus it is by construction silent on the effects of globalisation. Finally, it is important to mention the recent paper of Koh et al. (2020) who claim that the reclassification of the intellectual property products (IPP) from expenditure to investments carried out by NIPA that has occurred starting from 2000 may have strongly contributed to explaining the recent reduction of the labour income share, but in a purely accounting sense.

This paper is also related to the literature stressing the importance of firm heterogeneity for understanding aggregate patterns, such as Basu and Fernald (1997), Kehrig and Vincent (2021) and Sterk et al. (2021). Basu and Fernald (1997) were among the first to show that ignoring firm heterogeneity can bias production function estimates at higher levels of aggregation, above all when firm heterogeneity evolves dynamically. This is coherent with the results of the present paper. Kehrig and Vincent (2021) investigate empirically the decline of the US labour share using microdata of the manufacturing sector. They document a reallocation of the value added toward the lower end of the labour share distribution. They claim that firm heterogeneity has an important role in the labour share decline, while the entry-exit mechanism seems relatively less important. This paper uses a data set and an empirical strategy different from those used by Kehrig and Vincent (2021) and shows instead that both heterogeneity and firm dynamics play a role in the rise of capital intensity and the decline of the labour share. Related to a different topic, Sterk et al. (2021) makes an important contribution showing the importance of ex-ante heterogeneity in determining firms' performance. Ex-ante heterogeneity is also at the core of the results described in the present paper.

To conclude, this paper does not deal with growth, but the developed model is also related to the growth literature studying factor substitutions, like Jones (2005), Zuleta (2008) and Peretto and Seate (2013). In these models, firms may change their capital intensity by investing in R&D. This leads to endogenous technical progress, changing factor elasticity and growth. Differently from them, in this paper the decline of the labour share is based on the entry of new firms and changes in firm composition rather than investments in R&D.

3 The model

The economy is described by a two-sector RBC model. The two sectors produce the final consumption goods and the investment goods. In each sector, firms compete under perfect competition. The production of the consumption goods is characterised by the presence of heterogeneous firms and endogenous firm dynamics. All firms are owned by the representative household. The latter consumes and invests in physical capital and supplies capital and labour to the consumption goods sector. Physical capital is acquired from the investments goods sector. There is no uncertainty and all agents have perfect foresight. All payments in this economy are made in terms of the final consumption goods, which is the numeraire. In what follows the model is described and solved using numerical methods.

3.1 Households

The representative household chooses consumption C_t, investments into physical capital I_t and the supply of labour L_t. The utility in period t of the representative household is

$$U_t = \log\left(C_t\right) - \frac{L_t^{1+\phi}}{1+\phi} \tag{1}$$

Where C_t is consumption and L_t denotes hours worked. The representative household maximises the expected discounted value of her life-time utility, subject to the inter-temporal budget constraint

$$C_t + \zeta_t I_t = w_t L_t + R_t K_t + \Pi_t \tag{2}$$

where ζ_t is the relative price of investment (see Section 3.2) and $\zeta_t I_t$ is the value of investments in terms of the consumption good. The budget constraint states that total expenditure in consumption and investment goods equals total income. The household receives income from working, $w_t L_t$, from the return of capital, $R_t K_t$ (where R_t is the competitive interest rate) and the from firms' profits, Π_t. The stock of capital evolves according to the following law of motion

$$K_{t+1} = \left(1-\delta\right) K_t + I_t. \tag{3}$$

where δ is the depreciation rate. The household's first order conditions are:

$$w_t = C_t L_t^{\phi} \tag{4}$$
$$C_t^{-1}\zeta_t = \beta C_{t+1}^{-1}(R_{t+1} + (1-\delta)\zeta_{t+1}) \tag{5}$$

where the equations represent respectively the labour supply and the Euler equation.

3.2 Investment Goods

Perfectly competitive firms purchase Y_t^I units of the aggregate final good to transform them into investments goods I_t. The investment goods are then sold to households at a unit price P_t^I. The optimal problem of the firms producing investment goods is thus to maximise the profit function

$$\Pi_t^I = P_t^I I_t - P_t Y_t^I \tag{6}$$

subject to their production technology, given by

$$I_t = \frac{1}{\zeta_t} Y_t^I \tag{7}$$

where $1/\zeta_t$ represents investment-specific technology. First order condition, i.e. equality between marginal cost and marginal revenues, implies:

$$\zeta_t = \frac{P_t^I}{P_t} \tag{8}$$

which is the relative price of the investment.

3.3 Consumption Goods

The consumption goods production sector is composed of a continuum of firms producing homogeneous goods in a perfectly competitive market. Although the goods produced are homogeneous, firms differ in terms of their specific technology. In particular, a firm of type i produces the output y_i using the following Cobb-Douglas technology:

$$y_{i,t} = \left(k_{i,t}^{a_i} l_{i,t}^{1-a_i}\right)^{\rho} \tag{9}$$

The parameter $0 < \rho < 1$ defines a decreasing return to scale production technology, $a_i \in [a_{\min}, a_{\max}]$ is the elasticity of output with respect to capital and is heterogeneous across firm types. The parameters $a_{\min}$ and $a_{\max}$ are exogenous lower and upper bounds defining the feasible set of a_i. Period t real profits of incumbent firm i, $\Pi_{i,t}$, are defined as

$$\Pi_{i,t} = y_{i,t} - w_t l_{i,t} - R_t k_{i,t} - f w_t, \tag{10}$$

where $w_t l_{i,t}$ represents firm i's total cost of labour, $R_t k_{i,t}$ is the cost paid for renting capital from the household and $f w_t$ is fixed operative cost paid in units of labour. The maximisation of firms profits gives the optimal demand for labour and capital, which are respectively given by

$$R_t = \rho A_t \left(k_{i,t}^{a_i} l_{i,t}^{1-a_i}\right)^{\rho-1} a_i k_{i,t}^{a_i-1} l_{i,t}^{1-a_i} = \rho a_i \frac{y_{i,t}}{k_{i,t}}, \tag{11}$$

$$w_t = \rho A_t \left(k_{i,t}^{a_i} l_{i,t}^{1-a_i}\right)^{\rho-1} (1-a_i) k_{i,t}^{a_i} l_{i,t}^{-a_i} = \rho (1-a_i) \frac{y_{i,t}}{l_{i,t}}. \tag{12}$$

From Eq.(12) and Eq.(11), it is possible to derive the labour share of income of each type i active firm:

$$ls_{i,t} = \frac{w_t L_{i,t}}{y_{i,t}} = \rho (1-a_i) \frac{L_{i,t}}{l_{i,t}}, \tag{13}$$

and capital share of income

$$ks_{i,t} = \frac{R_t k_{i,t}}{y_{i,t}} = \rho a_i \frac{L_{i,t}}{l_{i,t}}, \tag{14}$$

where $L_{i,t} = l_{i,t} + f$ is the total demand of labour of firm i operative and producing at time t. Notice that both the firm-specific labour income share and the capital income share are type-specific and crucially depend on type i's output elasticity of capital, a_i. The higher the value of a_i, the lower the labour income share and the higher the capital share.

3.3.1 Firm dynamics

The mass of firms is constant and normalised to 1. However, the economy features firms' entry and exit. In each period incumbent firms face an exogenous probability η to exit the market, so that a share η of each type of incumbent firms exits the economy. The exiting firms are substituted by a mass η of new entrants. To enter the markets firms pay an exogenous sunk entry cost, f^e. As in Bilbiie et al (2012), the entry cost is defined in units of labour. This implies that entrants are required to hire f^e effective labour units at the cost w_t. The types of new firms are determined endogenously through the following entry condition:

$$v_{i,t}(a_i) = \Pi_{i,t}(a_i) + \beta v_{i,t+1}(a_i) \geq f^e w_t \tag{15}$$

Therefore, a firm of type i is willing to enter the market if and only if the stream of its discounted profits is greater than or equal to the entry cost. All types satisfying the entry condition constitutes the set of potential entrants. In each period a mass η of new firms uniformly distributed on the set of potential entrants enters the market. This is the key mechanism that explains the change in firms' composition.

3.3.2 Market Clearing

Market clearings hold in all markets. The labour supply of the representative household, L_t, equals the aggregate labour demand. The latter is the sum of three components: i) the labour demand coming from firms' specific labour used as input to produce the consumption goods, $L_{yt} = \int_0^1 l_{i,t} di$; ii) the labour units used for the fixed costs, $L_{ft} = f$; and iii) the labour units used to produce new firms, $L_{et} = \eta f^e$. Thus, labour market clearings imply

$$L_t = L_{yt} + L_{ft} + L_{et}. \tag{16}$$

Similarly, the total capital supplied by the households, K_t, equals the aggregate capital demanded by all firms, implying

$$K_t = \int_0^1 k_{i,t} di, \tag{17}$$

and aggregate output is

$$Y_t = \int_0^1 y_{i,t} di, \tag{18}$$

By definition, the aggregate labour and capital income share are:

$$LS_t = \frac{w_t L_t}{Y_t} \tag{19}$$

and

$$KS_t = \frac{R_t K_t}{Y_t}. \tag{20}$$

Finally, the aggregate resource constraint is derived by combining the households' resource constraint with the definition of aggregate firms' profits. It implies that the total aggregate output Y_t equals the total demand for the consumption goods C_t and for the investment goods, I_t, that is:

$$Y_t = C_t + \zeta_t I_t. \tag{21}$$

4 Quantitative Performance

This section studies the quantitative performance of the theoretical model by calibrating the economy to annual US data and feeding the model with the observed decline of the relative price of investment. This is done in two steps. The first step analyses the long-run effects of a permanent cut in the relative price of investment as observed in US data between 1980 and 2019. This corresponds to a 31.4 percent permanent cut in the relative price of investment goods. The second step analyses the transition dynamics by feeding the model with the same path of the relative price of investment observed in the US from 1980 to 2019. The transition dynamics of the labour share and capital intensity implied by the model is then compared with the observed US patterns.

Calibration. The model is solved numerically and calibrated at yearly frequency. The subjective discount rate β is set to 0.96, as standard in the literature for annual calibration. The depreciation rate of physical capital is set to 10 percent, as reported by Cooper and Haltiwanger (2006) and within the range of the values normally used in the literature. The parameter of the decreasing return to scale is calibrated to $\rho = 0.85$, a value which is within the range of the parameters estimated by Burnside et al. (1995)[4] and Basu and Fernald (1997), and used by Khan and Thomas (2013), Sedláček (2020), and Clementi and Palazzo (2016), among others. The firms' specific elasticity of output with respect to capital, a_i, is distributed across firms with a support of $a_i \in [0.01, 0.46]$. The upper bound of a_i and the fixed cost parameter, f, are set to target the labour income share and the profits share of the first steady state, which are respectively equal to 0.631 and 0.067, as they are in the US data for the year 1980.[5] The firms' annual exit rate is $\eta = 0.084$ consistent with the average BDS establishment exit rate over the data sample 1980-2019. We set the entry cost f^e so that the ratio of the entry cost to the operational fixed cost is $f^e/f = 0.82$, a value that corresponds to the estimates of Barseghyan and DiCecio (2011). Finally, as commonly occurring in the literature, the inverse Frisch elasticity of labour supply ϕ is set to 2. The technical Appendix shows robustness exercises with alternative values of ϕ and ρ.

4.1 Steady State Analysis

The aim of this subsection is to describe the long-run responses of main macro variables after a permanent cut of the relative price of investment of 31.4 percentage points, as experienced in the US economy between 1980 and 2019 (U.S. Bureau of Economic Analysis, 2021a). First, to disentangle the role of firm heterogeneity from that of endogenous firms' entry, the steady state analysis compares the results of the baseline model with that of the same model where firms are heterogeneous, but the

[4]They use several data sets; in quarterly three-digit manufacturing data, for example, they report estimates of the return to scale between 0.8 and 0.9.

[5]The series are the labour share for the Business Sector in the US (U.S. Bureau of Labor Statistics, 2021) and the share of corporate profits on gross domestic income downloaded from FRED (U.S. Bureau of Economic Analysis, 2021b). The implied value of the fixed cost parameter, f, is 0.114

entry margin is shut down.[6] Furthermore, the artificial data of the two steady states generated by the baseline model - characterised by a Cobb-Douglas production function and thus by unitary Input Elasticity of Substitution (IES = 1) at firm-level - are used to compute an aggregate "*implied*" IES. The implied IES is computed using the equation estimated by Karabarbounis and Neiman (2014, henceforth KN) and derived from a more general CES production function, where the Cobb-Douglas is only a limiting case with IES = 1. This counterfactual exercise allows us to understand whether the estimates found in KN may result from firm heterogeneity and dynamics and therefore from a change in firms' composition, rather than from a CES production function with IES > 1.

4.1.1 The Role of Firm Heterogeneity and Entry

Table 1 shows the long-run values of the main macroeconomic variables before and after a 31.4 percent cut of the relative price of investment goods ζ, corresponding to the decline of the relative price of investment observed in the US private sector between 1980 and 2019 (U.S. Bureau of Economic Analysis, 2021a). In particular, Table 1 shows the aggregate labour income share, the aggregate capital income share and the aggregate profits share. Also, it reports the average value of a_i in the economy, the aggregate capital intensity - measured as the ratio between aggregate capital and aggregate labour - the wage and the interest rate. Columns 1 and 2 show the level values, while column 3 shows the associated percentage changes. Column 4 shows percentage changes implied by the baseline model in the case of no firm dynamics. The comparison between columns 3 and 4 allows disentangling the effects of the two main ingredients of the baseline model: heterogeneity and firm dynamics.

As shown in the Table, a 31.4 percent decline in the relative price of investment is followed by a decrease of the aggregate labour income share of 6 percentage points. The increase of the aggregate capital income share is 5.3 percentage points, while the profit share increases by almost 0.7 percentage points. These results are qualitatively in line with what is found in KN using a CES production function. However, they are obtained using a completely different model, that relies on firm heterogeneity and dynamics. Thus, this paper has the potential to micro-found previous findings of KN and, therefore, contribute to a better understanding of the sources of the labour share decline. Furthermore, notice that in the model described by KN the labour share moves one to one with the capital share and the profits share remains unchanged, whereas in this model the labour share decline is accompanied also by an increase of the profits share, which is in line with empirical evidence.

[6]Steady states are computed numerically and the continuous parameter $a_i \in [a_{min}, a_{max}]$ is approximated by a grid of 2000 points.

Column 4 displays the impact of the shock to the relative price of investment when the entry mechanism is removed. The comparison between columns 3 and 4 allows disentangling the contribution of entrants and incumbents. In particular, such comparison shows that the reaction of incumbents accounts for 1/2 of the decline of the labour share and 2/3 of the increase of capital intensity following the cut in the relative price of investment. In the presence of heterogeneity, a lower relative price of investment favours incumbents with high capital intensity and low labour share. The entry mechanism amplifies the impact by changing the distribution of firms in the market.

Variable	ζ=1	ζ=0.686	Baseline model (Δ %)	No entry (Δ %)
$AggLS$ (%)	63.10	57.11	-5.99 *	-2.88 *
$AggKS$ (%)	30.20	35.54	5.33 *	2.57 *
$AggPS$ (%)	6.70	7.36	0.66 *	0.32 *
a_i average	0.32	0.41	0.09 *	0
K/L	2.78	6.75	142.74	95.58
Y	1.21	1.69	39.18	22.72
w	0.82	1.05	28.11	18.03
R (%)	14.17	9.72	-4.45 *	-4.45 *

* in % points.

Table 1: Columns 1-3: Baseline model. Column 4: Baseline Model with No Entry.

The main mechanism behind the results in the baseline model is the following. As the relative price of investment goods declines, household supply of capital increases, and the return of capital decreases. This brings about an increase in wages and entry costs.[7] Profits of firms with high capital intensity increase above the entry costs, while profits of firms with low capital intensity remain below entry costs. Thus, only firms with high capital intensity enter the market. Meanwhile, a uniformly distributed fraction η of incumbents exits. This leads to a substitution mechanism so that the average value of the a_i increases. Firms with high capital intensity use less labour input than average, the aggregate labour income share declines, while the capital share and the profits share increase.

In the baseline model, the reaction of the real wage is stronger than the reaction displayed by the model with no entry. The reason is that using the baseline model, the

[7]The long-run dynamics of the entry costs reproduced by the model is also in line with empirical evidence reporting that they have increased in the last 40 years (Philippon, 2019; Gutiérrez and Philippon, 2019; Al-Ubaydli and McLaughlin, 2017).

reduction of the real interest rate caused by the cut in the relative price of investment induces firms with high capital intensity to enter the market.[8]

It is important to notice that the assumption of entry costs paid in units of labour is not necessarily required to obtain the results. In fact, when entry costs are paid in terms of output, the labour share declines from 63.10 to 58.08.[9]

Finally, Appendix B shows the results of robustness checks obtained calibrating the model using the same strategy adopted before, but considering alternative values of the parameters of the Frisch elasticity of labour supply, ϕ, and of the return to scale, ρ. Results remain qualitatively unchanged.

4.1.2 Implied CES estimates over time

The aim of this subsection is to show that ignoring firm heterogeneity yields a different interpretation of the mechanism linking labour share and relative price of investment. KN show that the decrease of the labour share is related to the decline of the relative price of investment by using a model with CES production function and with an estimated IES greater than 1. The estimation is performed using an equation derived from the first order conditions of the model (i.e., Eq. (19) in KN) and using cross-country data. Their model, however, features homogeneous firms and no firm dynamics.

In this subsection, the following question is raised. Suppose that the true data generator process is a model characterised by firm heterogeneity and dynamics, like the baseline model. What is the implied value of the IES estimated using the same equation used by KN?

To answer this question, the *model-implied* IES is computed using the steady state values from the model and the same equation as in KN:

$$\sigma = \frac{s_L}{1-L}\hat{s}_L\frac{1}{\hat{R}} + 1 \tag{22}$$

where σ is the IES, s_L is the labour share in the first steady state, $\hat{s}_L$ is the percentage change of the labour share between the first and second steady state and $\hat{R}$ is the percentage change of the interest rate between the first and second steady state.[10]

In order to disentangle the role of firm heterogeneity from that of firm dynamics, the model-implied IES is computed using the steady state values of labour share and

[8]Other shocks have affected the economy in the last four decades and may have implied a decrease in the real wage. For example, increased firms' market power (De Loecker et al., 2020a) and reduction in workers' bargaining power (Blanchard and Giavazzi, 2003) may have contributed to dampening the response of the real wage.

[9]The changes of the other variables are also close to those of the baseline model shown in Table 1.

[10]Notice that in this exercise the coefficient γ in Eq.(19) in KN is zero by construction.

interest rate from both the baseline model and the "no-entry" model. The model-implied IES of the baseline model is $\sigma = 1.51$, while the IES of the no-entry model is $\sigma = 1.25$. Both these values are within the range of the estimates reported by KN. Thus, the results are coherent with the analysis made by KN. However, this exercise shows that their estimates may result from firm heterogeneity and entry mechanism, rather than from a CES production function with $\sigma > 1$.

In other words, the answer to our previous question is affirmative: an economy with firm heterogeneity and endogenous firm dynamics reacts to a cut to the relative price of investment (proxied as in KN by a cut in interest rate) *as if* the aggregate production function were a CES with an IES > 1. Remarkably, this confirms that heterogeneity and firm dynamics are important in the interpretation of the relationship between the labour share and the relative price of investment.

Finally, the elasticity of substitution computed using the US aggregate data on labour share and real interest rate in the years 1980 and 2019, as done by KN, yields a value of $\sigma = 1.29$.[11] The estimated value is close to the values estimated in KN and to the values yielded by the estimation using artificial data. Overall, these estimates confirms that using aggregate data to compute the IES may give a distorted interpretation of the mechanism behind the labour share decline.

4.2 Dynamics

This section studies the model implied dynamics by feeding the economy with observed series of the US relative price of investment in the period 1980-2019. Analysing the dynamics of the model is important because it provides an implication of the entry mechanism that will be tested empirically in Section 5. The dynamics is solved numerically through time-iteration. The resulting time series of labour share and capital intensity are shown in Figure 1 together with the observed series. As shown in the Figure, the model predicts the declining pattern of the labour share and the increasing pattern of capital intensity. The artificial series are smoother than the observed series, particularly that of the labour share. This is expected. In fact, in the considered time frame, the US economy was hit by a battery of shocks, while the model takes into account only the dynamics of the relative price of investment. To disentangle the effect of firm heterogeneity from that of firm dynamics, the baseline model is compared to the no-entry model. As shown also in the steady state analysis (see Table 1), the presence of the entry mechanism amplifies the impact of the decline of the relative price of investment on labour share and capital intensity.

[11]Data of the Labour share refers to the BLS series of the US Business Private sector. The real interest rate used is downloaded from:
https://data.worldbank.org/indicator/FR.INR.RINR?locations=US

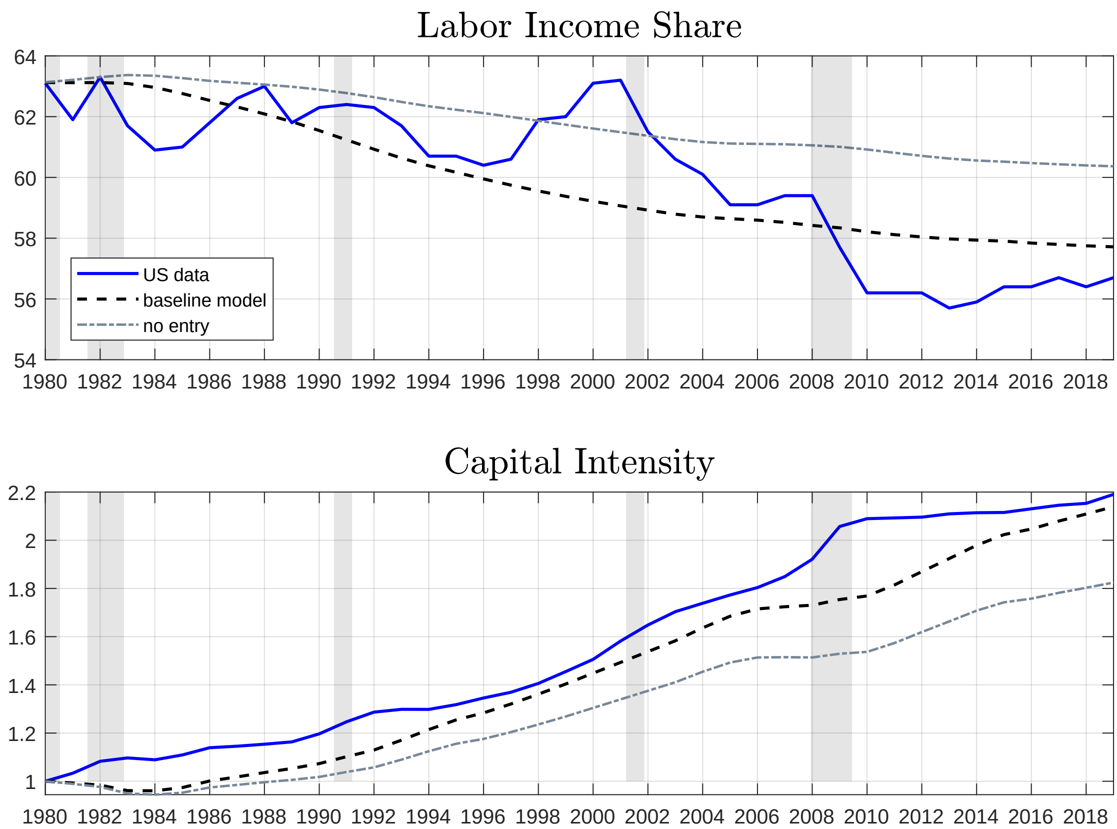

Figure 1: Dynamics. **Upper panel**: Observed labour share in the US (U.S. Bureau of Labor Statistics, 2021), the labour share implied by the baseline model and the labour share implied by the baseline model without firm dynamics. **Lower panel** Observed capital intensity in the US Penn World Table (2021), the capital intensity implied by the baseline model and the capital intensity implied by the model without firm dynamics (all normalised to 1 in 1980).

It is now useful to analyse the implications of the model in terms of *firm-level* capital intensity and labour share in response to a decline in the relative price of investment.

The left and the right panels of Figure 2 show respectively the average capital intensity and labour share implied by the model in year 2009 of firms born in 1989, 1994, 1999 and 2004.[12] The Figure shows that firms with a more recent year of birth present on average higher capital intensity and lower labour share.

These results suggest that in the empirical exercise, firms' year of birth should correlate positively their capital intensity and negatively their labour share. Moreover, in the model this outcome is determined by the decline of the relative price of investment, so firm-level data should display a negative relationship between the

[12] The same Figure could be produced with any year of observation and any set of years of birth.

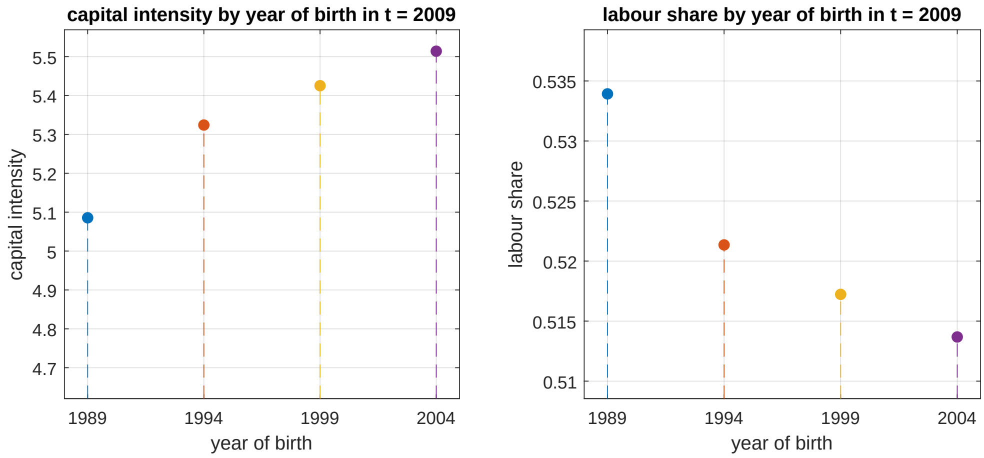

Figure 2: Left: Model prediction of average capital intensity in 2009 of firms born in years 1989,1994,1999 and 2004. **Right**: Model prediction of average labour share in 2009 of firms born in years 1989,1994,1999 and 2004.

relative price of investment *in the year of birth* and capital intensity and a positive relationship between the relative price of investment *in the year of birth* and labour share. This is particularly important because it constitutes the empirical implication of the model that is tested in the next section.

Finally, it is worth underlining that this model considers an exogenous exit rate. Introducing endogenous exit would confirm the results and speed up the dynamics since - in addition to the lower incentives to enter - low capital intensity firms would also face a higher endogenous rate of exit as the relative price of investment drops.

5 Empirical Evidence

This section presents empirical evidence supporting the "entry mechanism" described by the model. In particular, the model predicts that the relative price of investment affects the capital intensity and labour share of entrants. To test this prediction, this section analyses the relationship between the year of birth - and the relative price of investment in the year of birth - and firms' capital intensity and labour share. To this end data on the US industry-level investments price from 1970 to 2018 is downloaded from BEA. Moreover, US firm-level data from 2011 to 2018 is downloaded from ORBIS (Orbis, 2021). In particular, data are collected on firms located in the US, born from 1950 onward. This provides an unbalanced panel containing BvD ID number, the NACE Rev. 2 code sector, the date of incorporation (year of birth), number of employees and tangible fixed assets, fixed assets, sales, net sales, added value, cost of employees, costs of goods sold and other operating expenses evaluated in USD. These data are used to compute firm-level capital intensity and labour share, among others. As frequently seen in the literature, sectors with ISIC code O, T and U, corresponding respectively to the sectors *Public administration and defence; compulsory social, security*, *Activities of households as employers* and *Activities of extraterritorial organisations and bodies* are excluded from the sample. The data set is then cleaned to keep only observations with well defined capital intensity and non-negative age. Moreover, in accordance with Karabarbounis and Neiman (2014), the analysis of the main text will focus only on firms born after 1980.[13]

By relating the year of birth - and the relative price of investment in the year of birth - to capital intensity and labour share in 2011-2018, this section is jointly testing two assumptions. Firstly, firms' production technology is influenced by the relative price of investment in the year of birth. Secondly, differences between firms at birth are persistent over time. Thus, this analysis investigates the importance of ex-ante heterogeneity, which is at the core of the entry mechanism described in the model, and is in line with recent literature (Sterk et al., 2021).

The section is divided in two subsections. The first subsection focuses on capital intensity and the second on labour share.

5.1 Empirical Evidence on Capital Intensity

The objective of this sub-section is to investigate the empirical relation between the firm-level capital intensity, the year of birth and the relative price of investment in the year of birth. Following Gopinath et al. (2017), capital stock is measured by deflating the book value of fixed assets using the two-digit industry-level price of investment.[14] Capital intensity of firm i in year t is determined as:

$$k_{it} = \frac{\text{deflated fixed assets}_{it}}{\text{number of employees}_{it}} \tag{23}$$

The aim of first regression is to correlate the logarithm of *today's* capital intensity - observed from 2011 to 2018 - with the year of birth. In order to control for a possible life cycle effect (see, e.g. Kueng et al., 2014), an age dummy is included in the regression. The age dummy captures the change of capital intensity of incumbents not captured by the other controls. Controls include also a two-digit industry dummy, size of firms proxied by the logarithm of real sales and the real GDP growth in the

[13] Results do not change if also firms born from 1970 are included in the analysis (see Appendix D). It is not possible to include firms born earlier than 1970 because the industry-level relative price of investment, used later as regressor, is available only from 1970.

[14] U.S. Bureau of Economic Analysis (2019). At the time of writing the investments deflator for 2019 was not yet available, therefore observations from that year were excluded.

year of observation to control for business cycle effects:[15]

$$\log(k_{it}) = const + \text{dummy year of birth}_i + \text{controls} + \epsilon_{it} \tag{24}$$

The left panel of Figure 3 shows the year of birth profile resulting from the regression. It shows that firms with a more recent year of birth display on average a higher capital intensity. This is in line with the predictions of the model shown in the left-panel of Figure 2. It is interesting to notice that from 2011 onward, the year of birth profile flattens, consistent with the dynamics of aggregate capital intensity and aggregate relative price of investment shown in Appendix A.

To determine the quantitative importance of the entry mechanism, a counterfactual analysis is performed by computing the estimated firm-level capital intensity when the same year of birth - 1980 - is imposed to all firms. The average estimated capital intensity computed with this counterfactual is about 28% lower than the capital intensity estimated with the full model. As a comparison, a second counterfactual is performed by switching off the age channel. The age dummy captures the change in capital intensity occurring to incumbent firms. The capital intensity estimated by imposing age equal zero to all firms is about 9% lower than the capital intensity estimated with the full model. These results suggest that the entry mechanism is quantitatively important in determining the observed capital intensity.

To check the robustness of these estimates, a second empirical strategy is adopted. Following Deaton (1985, 2019), data are transformed to build a *pseudo-panel*. Pseudo-panels are useful when there is the need to decompose age and cohort effects (see, e.g., Propper et al., 2001; Di Novi and Marenzi, 2019). To build a pseudo-panel, observations are clustered together according to a set of time invariant characteristics. Each cluster represents a firm "type", where the type is determined by its time invariant characteristics. In this paper, firms are grouped by their two-digits industry and by their cohort of birth. Firms born from 1980 to 1984 are part of cohort 1, firms born from 1985 to 1989 are part of cohort 2, and so on. The last cohort is cohort 7 including firms born from 2010 to 2018. Clustering firms by cohort of birth, rather than by year of birth, allows to increase the number of firms in each cluster and reduce the number of dummies to be estimated. For each cluster, in each year of observation, the average logarithm of capital intensity, logarithm of real sales and age are computed. Essentially, each cluster describes a representative firm within a given industry and cohort, in each observed year. The transformed data are used to regress the following equation:

$$\log(k_{ct}) = const + \text{dummy cohort}_c + \text{controls} + \epsilon_{ct} \tag{25}$$

where subscript c denotes the cluster. Controls include an industry dummy, age and average log of real sales in each cluster and real GDP growth in the year of observation.

[15]The real GDP is downloaded from FRED database.

It is useful to notice that the variable age is now a continuous variable describing the average age of firms in each cohort. The model is estimated using weighted least squares to account for the fact that each cluster is composed by a varying number of observations. The cohort profile is shown in the right panel of Figure 3. The pseudo-panel confirms the results of the estimation performed using the original data set. There is a persistent ex-ante heterogeneity component determining firms' capital intensity, captured by the cohort dummies.

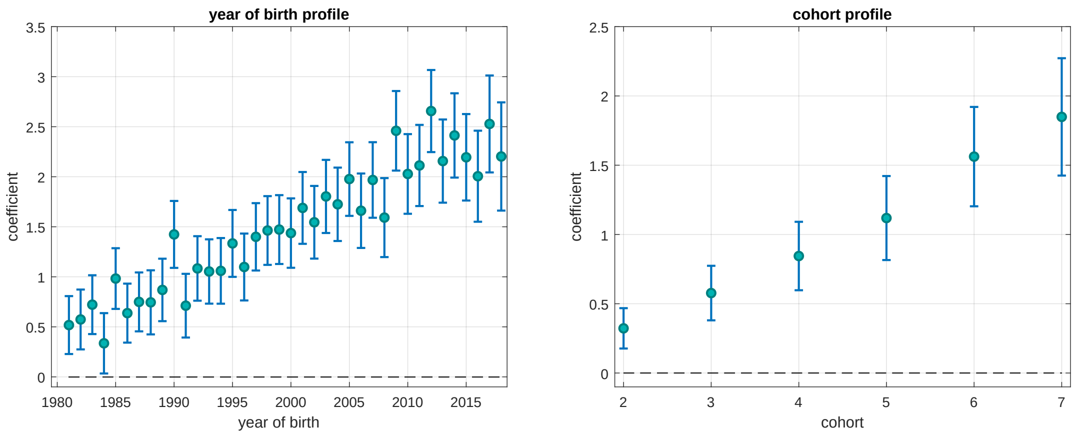

Figure 3: Left panel: The year of birth profile with 90% confidence intervals. **Right panel:** The cohort profile with 90% confidence intervals.

The relative price of investment in the year of birth. The next step is to understand why firms with a more recent year of birth choose a relatively higher capital intensive technology. According to the theoretical model, a plausible answer is that technology at birth depends on prevailing economic conditions in the period of birth, and in particular on the relative price of investment in the year of birth. In order to verify this prediction, the following equation is estimated:

$$\log(k_{it}) = const + \log(p_i^{yob}) + \text{dummy year of birth}_i + \text{controls} + \epsilon_{it} \tag{26}$$

where p_i^{yob} is the industry-specific relative price of investment in the year of birth of firm i. The controls include the age dummy, the logarithm of real sales and real GDP growth in the year of observation. Since the relative price of investment in the year of birth is time invariant and industry specific, the industry dummy is excluded from the regression. Eq. (26) is estimated both with and without the year of birth dummy. Results are reported in Table 2. They show a clear negative impact of the relative price of investment in the year of birth on capital intensity. In particular, firms

Dependent variable: $\log(k_{it})$

	(a)	(b)	(c)
$\log(p_i^{yob})$	-1.50^{***}	-1.69^{***}	-1.63^{***}
yob dummy	No	No	Yes
controls	No	Yes	Yes
Number of observations:	20 046	18 529	18 529

Robust standard errors in parenthesis.
$^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Estimation of Eq. (26). All regressions include the age dummy, the logarithm of firms' real sales and real GDP growth rate in the year of observation. All regressions include a constant.

experiencing a 1% higher relative price of investment in their industry - in the year of birth - are characterised by a 1.63% lower capital intensity, also when controlling for the year of birth.

Finally, to fully isolate the impact of the relative price of investment on capital intensity, it is possible to exploit the cross-industry variation of the relative price of investment. To this end, Eq. (26) is estimated separately for each year of birth.

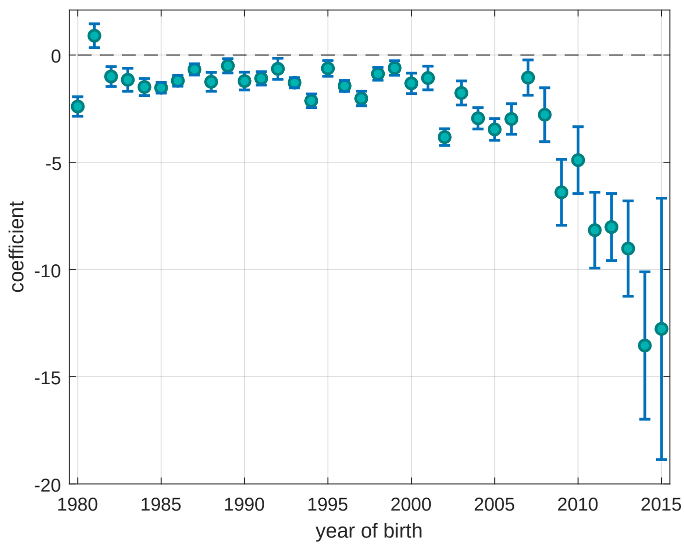

Figure 4: The coefficient of the industry-specific price of investment estimated separately for each year of birth and 90% confidence intervals. Only coefficients up to 2015 are displayed for the sake of readability.

Such estimation captures the impact of different relative prices of investments across industry by fixing the year of birth. Results are shown in Figure 4 and confirm the negative correlation between capital intensity observed in 2011-2018 and the relative price of investment in the year of birth.[16]

5.2 Empirical Evidence on Labour Share

The objective of this sub-section is to investigate the empirical relation between the firm-level labour share and the year of birth and the relative price of investment in the year of birth. The labour share is computed as

$$\text{ls}_{it} = \frac{\text{cost of employees}_{it}}{\text{value added}_{it}} \tag{27}$$

Moreover, firms' markups are used as controls and computed as the net profit margin, as in Anderson et al. (2018):

$$\text{markup}_{it} = \frac{\text{net sales}_{it} - \text{cost of goods}_{it} - \text{other expenses}_{it}}{\text{net sales}_{it}} \tag{28}$$

Observations with negative labour shares or labour shares greater than 1 and with negative markups or markups greater than 1 were excluded. Using these data, the following equation is estimated to compute the year of birth profile:

$$\text{ls}_{it} = const + \text{dummy year of birth}_i + \text{controls} + \epsilon_{it} \tag{29}$$

where controls include typical variables associated with labour share in the literature, i.e., industry dummy, markup and logarithm of real sales to proxy for size of firm i in year t. Moreover, to control for the life-cycle effect an age dummy is included. Finally, to control for the business cycle effect the growth rate of real GDP in the year of observation is included. The resulting year of birth profile is displayed in the left panel of Figure 5. It suggests that firms with a more recent year of birth display on average a lower labour share. This is in line with the predictions of the model shown in the right-panel of Figure 2. Notice that from 2011 onward, the year of birth profile flattens, consistent with the dynamics of aggregate labour share and aggregate relative price of investment shown in Appendix A. It is important to determine the quantitative importance of the year-of-birth effect on firms' labour share. To this end, a counterfactual analysis is performed by computing the estimated firm-level labour share when the same year of birth - equal to 1980 - is imposed to all firms. This provides a measure of the impact of the year of birth effect on the estimated labour

[16] It should be noticed that the base year of the relative price of investment is 2012, which has been re-based to 2018 in this exercise. Thus the variability of cross industry prices are artificially reduced as they get closer to 2018. This explains the relatively large negative coefficients estimated toward the end of the sample.

share. The counterfactual average labour share is about 9.5 percentage points higher then the average labour share estimated with the baseline model. As a comparison, a second counterfactual analysis is performed to determine the importance of changes occurring during firms' life. The life-cycle effect is mainly captured by firms' age. Therefore, to determine the impact of the life-cycle on estimated labour share, the same age - equal to zero - is imposed to all firms. The average labour share estimated with this second counterfactual is about 5.7 percentage points higher than the average labour share estimated with the baseline model. These results suggest that the economic conditions at birth are quantitatively important in determining the average labour share.

Moreover, the pseudo-panel analysis is replicated also for the labour share by estimating the following equation:

$$\text{ls}_{ct} = const + \text{dummy cohort}_c + \text{controls} + \epsilon_{it} \tag{30}$$

where c is the cluster, and control variables are computed as cluster averages. The cohort profile is shown in the right panel of Figure 5 and it confirms the results obtained with the original data set. As in the previous subsection, the relationship between

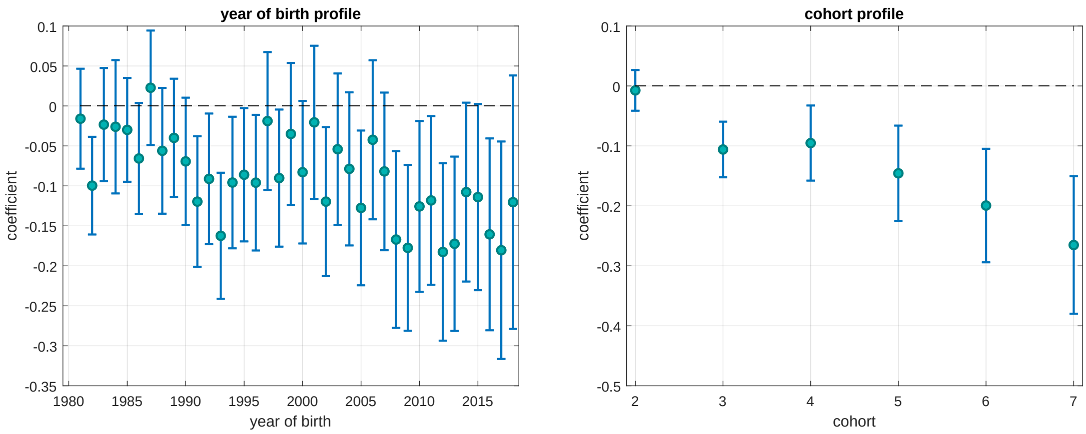

Figure 5: Left panel: The year of birth profile with 90% confidence intervals. **Right panel:** The cohort profile profile with 90% confidence intervals.

the labour share and the relative price of investment is investigated by regressing the following equation:

$$\text{ls}_{it} = const + \log(p_i^{yob}) + \text{dummy year of birth}_i + \text{controls} + \epsilon_{it} \tag{31}$$

where $\log(p_i^{yob})$ is the logarithm of the price of investment in the year of birth of firm i. The controls include year of birth dummy, age dummy, markup, logarithm of real sales and growth rate of real GDP in the year of observation. The estimation results using different specifications are shown in Table 3.

Dependent variable: labour share$_{it}$

	(a)	(b)
log p_i^{yob}	0.132^{***}	0.11^{***}
markup		-0.41^{***}
log sales		-0.02^{***}
yob dummy	Yes	Yes
age dummy	Yes	Yes
Number of observations:	4482	4482

$^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Estimation of Eq. (31). Estimations also include real GDP growth in the year of observation and a constant, not shown.

The coefficient of the relative price of investment is consistently and significantly positive, implying that a higher relative price of investment in the year of birth is associated to a higher labour share. This result is coherent with the estimates on capital intensity and can be interpreted as follows. A low relative price of investment induces firms to choose high capital intensity and low labour share technologies. This is coherent with the mechanism described by the theoretical model and with the idea that the economic environment at birth is very important in determining the characteristics of firms.

Finally, like the investigation regarding capital intensity, to isolate the impact of the relative price of investment on labour share, it is possible to exploit the cross-industry variation of the relative price of investment. To this end, firms are clustered together by year of birth. Cluster 1 is includes firms born from 1980 to 1984, cluster 2 firms born from 1985 to 1989, and so on. Eq. (29) is estimated separately for each cohort of birth. In this case the regressions are performed cohort by cohort, rather than year by year, to increase the number of observations in each regression. The coefficients of each regression capture the impact of different relative prices of investments across industry by fixing the cohort of birth. Results are shown in Figure 6 confirming the positive correlation between labour share observed in 2011-2018 and the relative price of investment of the industry in the cohort of birth. Among the firms born in the same cohort, those that experienced a lower industry-specific relative price of investment in the year of birth, display *today* a lower labour share.

Appendix D of this paper provides a set of robustness checks. In particular, it considers: *i*) the inclusion of firms born from 1970 in the sample; *ii*) tangible capital instead of total fixed asset to compute capital intensity; *iii*) data including

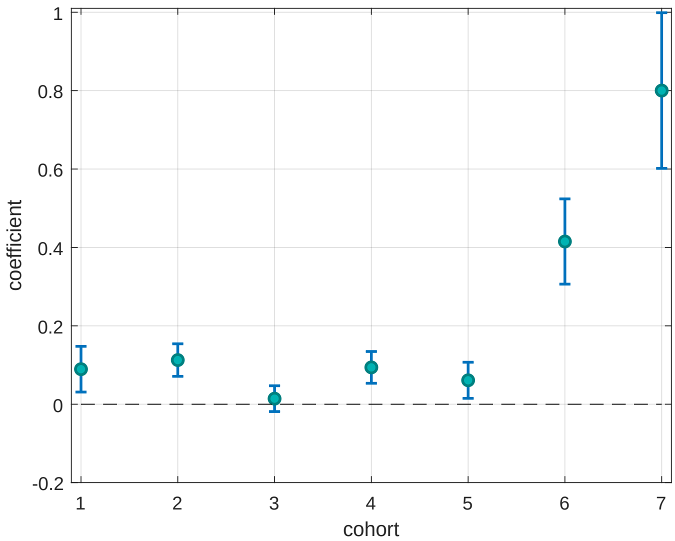

Figure 6: The coefficient of the industry-specific price of investment estimated separately for each cohort of birth and its 90% confidence intervals.

only manufacturing firms; *iv*) using panel analysis and finally, *v*) a different sample downloaded from Compustat from 1980 to 2018 to perform a panel analysis on a longer time sample. Appendix D shows that results are robust.

6 Conclusion

This paper considers two sectors heterogeneous firms model where firms' specific technology and capital intensity are endogenously determined through business dynamics. The model shows that in response to a reduction in the relative price of investment goods, new firms enter the market with a higher capital intensity of production and lower labour income share. Thus, this paper offers a new interpretation of the results found by Karabarbounis and Neiman (2014) based on firm heterogeneity and dynamics. Furthermore, this paper provides empirical evidence confirming the theoretical mechanism. Using ORBIS firm-level data of the US economy, this paper finds robust evidence suggesting that the technology chosen by firms on entry is influenced by the relative price of investment in the year of birth.

The paper does not intend to take a stand on a single explanation of the declining labour income share. The main contribution is to emphasise the role of firm heterogeneity and business dynamism affecting aggregate results. Such a role has been mostly neglected by the recent literature and can be considered as complementary to other determinants of the decline of the labour share.

7 Supplementary data

The data and codes for this paper are available on the Journal repository. They were checked for their ability to reproduce the results presented in the paper. The authors were granted an exemption to publish parts of their data because access to these data is restricted. However, the authors provided the Journal with temporary access to the data, which enabled the Journal to run their codes. The codes for the parts subject to exemption are also available on the Journal repository. The restricted access data and these codes were also checked for their ability to reproduce the results presented in the paper. The replication package for this paper is available at the following address: https://doi.org/10.5281/zenodo.7002828.

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